



Catalogue no. 16-201-XPE

Government
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Human Activity and the Environment

Annual Statistics 2007 and 2008

16-201

Feature Article

Climate Change in Canada



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Human Activity and the Environment: Annual Statistics

2007 and 2008

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April 2008

Catalogue no. 16-201-X

ISSN 1703-5775

Catalogue no. 16-201-XIE

ISSN 1703-5783

Frequency: Annual

Ottawa

La version française de cette publication est disponible sur demande (nº 16-201-X au catalogue).



Note of appreciation

Canada owes the success of its statistical system to a long standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

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- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

Acknowledgements

Human Activity and the Environment: Annual Statistics 2007 and 2008 has been prepared by the Environment Accounts and Statistics Division under the direction of Robert Smith (Director) and Doug Trant (Chief). Heather Dewar served as editor and project manager, Monique Deschambault, Jesse Flowers, Laurie Jong and Michelle Tait were the database managers and technical editors. Major contributions to the statistics and analysis presented in the report have been made by:

Patrick Adams

Avani Babooram

Heather Dewar

Joe St. Lawrence

Jennie Wang

Thanks to the following people for their technical support in the areas of marketing, graphic design, map creation, translation, reviewing, editing, proofreading, dissemination and technical development:

Johanne Beauseigle
Edelweiss D'Andrea
Line Ménard D'Aoust
Louise Demers and her team
Giuseppe Filoso
Nancy Hoffman
Elizabeth Irving

Lucie Lacroix
Anaëlle Lavoie
Annik Lepage
Mary-Frances Lynch
Myrlène Perdriel
Translation and Terminology services

The support and co-operation of the following federal departments and agencies is also gratefully acknowledged:

Agriculture and Agri-Food Canada

Environment Canada

Fisheries and Oceans Canada

Natural Resources Canada

Transport Canada

Canadian Council of Forest Ministers

Canadian Council of Ministers of the Environment

Canadian Council on Ecological Areas

Canadian Wildlife Federation

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Overview

Human Activity and the Environment publication

Canadians recognize the importance of a clean and healthy environment. We understand that the capacity of the environment to supply materials and absorb wastes is finite. But to be effective at reducing our collective impact on the environment we need systematic, accessible and relevant information. Without this basic information, we are unable to understand and respond to environmental change.

The annual **Human Activity and the Environment** (HAE) publications meet this need with a collection of environmental statistics brought together from many sources. The goal is to paint a statistical portrait of Canada's environment with special emphasis on human activity and its relationship to natural systems—air, water, soil, plants and animals.

Each annual issue of **Human Activity and the Environment** begins with a feature article (Section 1) covering a current environmental issue of concern to Canadians. The in-depth article provides data and analysis which complement the information presented in the *Annual statistics* compendium that follows.

The Annual statistics compendium of the **Human Activity and the Environment** report serves as a general reference for environmental statistics in Canada, pointing readers to available data on environment-human interactions. Divided into three sections, the compendium is organized using the state-pressure-response framework, in which information is classified as measuring the state of the physical environment at a point in time, the pressure placed on the environment by human activities, or the socio-economic response to environmental conditions. The current report includes 91 data tables, 14 charts and 7 maps, along with data highlights that briefly describe notable developments in relation to human activity and the environment to help the reader navigate through the data holdings.

Feature article

Section 1: Climate Change in Canada

The feature article "Climate Change in Canada" begins with an explanation of the science necessary to explore this topic. It continues by examining greenhouse gas emissions in Canada, investigating the driving forces behind those emissions and how those forces may have changed over time. It illustrates some of the impacts of climate change on our land, wildlife and peoples. The article presents activities that Canadians, industry and governments are undertaking to reduce greenhouse gas emissions and to adapt to the changing climate, and also profiles some promising areas for reducing greenhouse gas emissions in the future.

Annual statistics: an environmental data compendium

Section 2: Canada's physical environment

This section presents information and statistics on Canada's physiography and climate. Physiography, or physical geography, is the study of the physical features of the earth's surface. This section covers two of the key elements that make up Canada's physiography: land cover and hydrology.

Climate can be defined as the average weather that occurs in a specific area over a period of time. Humans rely heavily on the regularity of climate patterns for almost all of their activities. Climate is measured using various weather elements as indicators. These are presented in this section of the compendium.

Section 3: Pressures on Canada's Environment

This section begins by presenting information on the driving forces that shape the relationship between human activities and the environment—namely population, economic conditions and transportation. The section then examines one of the main sources of impacts on the environment—natural resource consumption—by presenting data and highlights on agriculture, fisheries, forestry, minerals and energy. The section concludes by looking at the impacts human activities have on ecosystems, focusing on air, land, water and wildlife statistics.

Section 4: Socio-economic response to environmental conditions

This section explores the way governments, businesses and households try to respond and adapt as environmental conditions change. This chapter describes activities and practices aimed at minimizing or reducing the harmful effects of human activity on the environment.

Related products

Selected publications from Statistics Canada

11-509-X	Human Activity and the Environment
11-526-X	Households and the Environment
16-002-X	EnviroStats
16-251-X	Canadian Environmental Sustainability Indicators
16-253-X	Canadian Environmental Sustainability Indicators: Socio-economic Information
16-254-X	Canadian Environmental Sustainability Indicators: Air Quality Indicators: Data Sources and Methods
16-255-X	Canadian Environmental Sustainability Indicators: Greenhouse Gas Emissions Indicator: Data Sources and Methods
16-256-X	Canadian Environmental Sustainability Indicators: Freshwater Quality Indicator: Data Sources and Methods
16-257-X	Environment Accounts and Statistics Product Catalogue
16-401-X	Industrial Water Use
16F0006X	Environmental Protection Expenditures in the Business Sector
16F0008X	Environment Industry: Business Sector
16F0023X	Waste Management Industry Survey: Business and Government Sectors
51-004-X	Aviation
52-216-X	Rail in Canada
53-222-X	Trucking in Canada
57-202-X	Electric Power Generation, Transmission and Distribution

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153-0002	Value of established crude oil reserves, annual
153-0003	Value of recoverable subbituminous coal and lignite reserves, annual

153-0004	Value of recoverable bituminous coal reserves, annual
153-0005	Value of established crude bitumen reserves, annual
153-0006	Value of proven and probable potash reserves, annual
153-0007	Value of proven and probable gold reserves from gold mines, annual
153-0008	Value of proven and probable iron reserves, annual
153-0010	Value of proven and probable reserves of miscellaneous minerals, annual
153-0011	Value of timber stocks (methods I and II), annual
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153-0013	Established crude oil reserves, annual
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153-0035	Land cover by category, Canada, major drainage areas and sub-drainage areas
153-0041	Disposal of waste, by source, Canada, provinces and territories, biennial
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153-0044	Business sector characteristics of the waste management industry, Canada, provinces and territories, biennial
153-0045	Local government characteristics of the waste management industry, Canada, provinces and territories, biennial

Selected surveys from Statistics Canada

1209	Environment Industry Survey
1736	Waste Management Industry Survey: Government Sector
1903	Survey of Environmental Protection Expenditures
2009	Waste Management Industry Survey: Business Sector
3881	Households and the Environment Survey
5114	Canadian System of Environmental and Resource Accounts - Natural Resource Stock Accounts
5115	Canadian System of Environmental and Resource Accounts - Material and Energy Flow Accounts
5120	Industrial Water Survey
7525	Land Cover Statistics from Natural Resources Canada

Selected summary tables from Statistics Canada

- *Revenues from sales of environmental goods and services, by industry*
- *Revenues from sales of environmental goods and services, by province or territory*
- *Government pollution abatement and control expenditures*
- *Expenditures on environmental protection by industry and activity*
- *Waste disposal, by source, by province*

Section 1

Climate change in Canada



Tidewater glacier, Devon Island, Nunavut, Brenda Saunders, 2007

Climate change is a global problem with global consequences. In 2006, warmer-than-average temperatures were recorded across the world for the 30th consecutive year (Chart 1.1). Increasing average temperatures are melting glaciers and polar ice caps and raising sea levels, putting coastal areas at greater risk of flooding. Mounting evidence indicates that these changes are not the result of the natural variability of climate. The theory of human-induced climate change is supported by numerous respected scientific bodies, including the British Royal Society, the American National Academies and the Intergovernmental Panel on Climate Change (IPCC).

The IPCC, established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), released its fourth assessment report in 2007. It declared that "warming of the climate's system is unequivocal" and that there is a "very high confidence" that human activity since 1750 has played a significant role in overloading the atmosphere with carbon dioxide (CO₂).

The IPCC is arguably the world's foremost scientific authority on the subject of climate change, and its role is to "assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate

change, its potential impacts and options for adaptation and mitigation."¹

One of the greatest concerns associated with climate change is the anticipated increase in the frequency of extreme weather events. The ice storm that struck eastern Canada in 1998 illustrates the magnitude of the potential impact of these events (Text box "Ice storm of 1998").

In addition to extreme weather events, other changes associated with climate change are more gradual. Lakes and rivers generally freeze later and thaw earlier than they used to, resulting in difficulties building and maintaining the ice roads that are vital for many

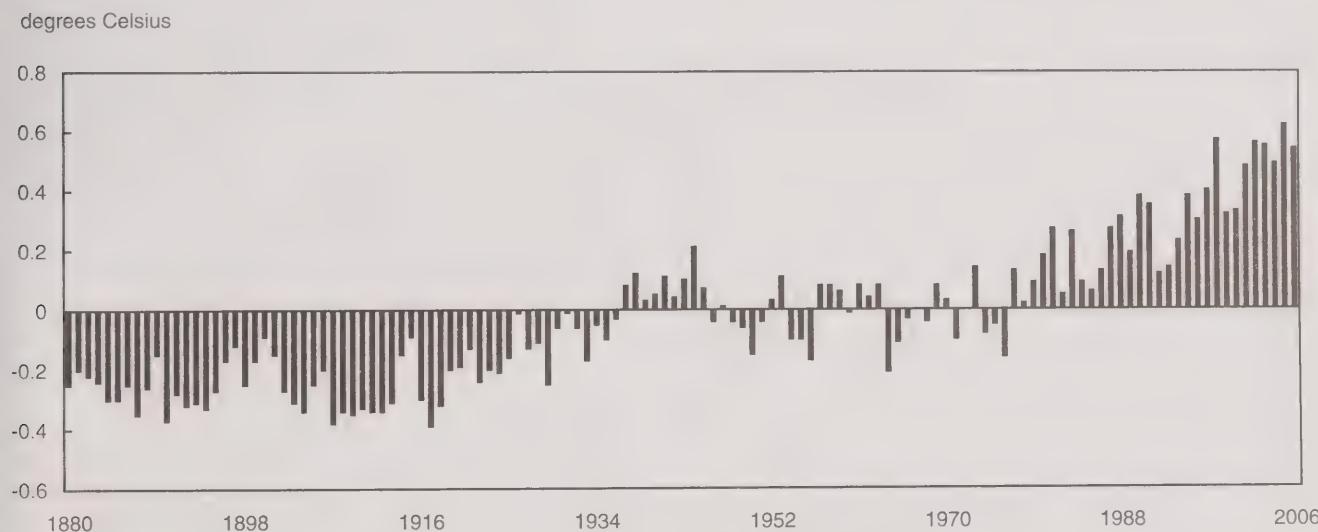
northern communities. Over the past 10 years, the network of ice roads in Manitoba has gone from 50 to 60 days of usage to as low as 20 days in some years.² A series of mild winters in the central interior of the province of British Columbia has supported the spread of the mountain pine beetle, a very serious forest pest, resulting in the death of pine trees across millions of hectares of forests.

Canada has about 0.5% of the world's population, but contributes about 2% of the total global greenhouse gas (GHG) emissions. This puts Canadians among the highest per capita emitters, largely as a result of the size of the country, the low density of the population, the high energy demands imposed by the climate, our resource-based economy, and the volume of goods we export. In 2005, slightly more than 23 tonnes of GHGs were emitted for each person in the country: this represents an 8% per capita increase since 1990.³

Numerous factors influence how climate change works and how those effects will be felt by people around the world, now and in the future.

1. Intergovernmental Panel on Climate Change website description of mandate, <http://www.ipcc.ch/about/index.htm> (accessed January 10, 2008).
2. Climate Change Connection, 2007, "Northern Communities: Winter Roads," <http://www.climatechangeconnection.org/Impacts/Northerncommunities.htm> (accessed February 12, 2008).
3. Environment Canada, 2007, *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005*. Greenhouse Gas Division, Ottawa, Ontario (see table S-1), http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm. (accessed March 10, 2008).

Chart 1.1
Variation from mean global temperature¹



1. Global annual temperature anomalies computed from land and ocean data.

Note(s): Anomalies are relative to the 1951 to 1980 base period means.

Source(s): Hansen, J.E., R. Ruedy, M. Sato, and K. Lo, 2007, NASA GISS Surface Temperature (GISSTEMP) Analysis, http://cdiac.ornl.gov/ftp/trends/temp/hansen/gl_land_ocean.dat (accessed March 4, 2008).

Ice storm of 1998

Event: 50 to >100 mm of freezing rain over 5 days

Location: Corridor extending from Kingston, Ontario, to New Brunswick, including the Ottawa, Montréal and Montérégie regions.

Deaths: 28

Injured: 945

Evacuated: 600,000

Other impacts: Massive power outages

Estimated cost: \$5.4 billion

Source(s): Natural Resources Canada, 2004, Climate Change Impacts and Adaptation: A Canadian Perspective, 174 pp., http://adaptation.nrcan.gc.ca/perspective/index_e.php (accessed March 10, 2008).

Section 1.1: Understanding climate change, provides an explanation of the science necessary to

explore this topic. In addition to defining weather, climate and climate change, it describes the greenhouse effect and explains the crucial role of GHGs in climate change.

Section 1.2: Greenhouse gas emissions, describes the state of knowledge of GHG emissions in Canada. It investigates the driving forces behind those emissions and how those forces may have changed over time.

Section 1.3: Climate change impacts, discusses Canada's climate and illustrates some of the impacts of climate change on our land, wildlife and peoples.

Section 1.4: How are we adapting? How are we responding to the challenge?, presents activities that Canadians, industry and governments are undertaking to reduce GHG emissions and to adapt to the changing climate, and also profiles some promising areas for reducing GHG emissions in the future.

1.1 Understanding climate change

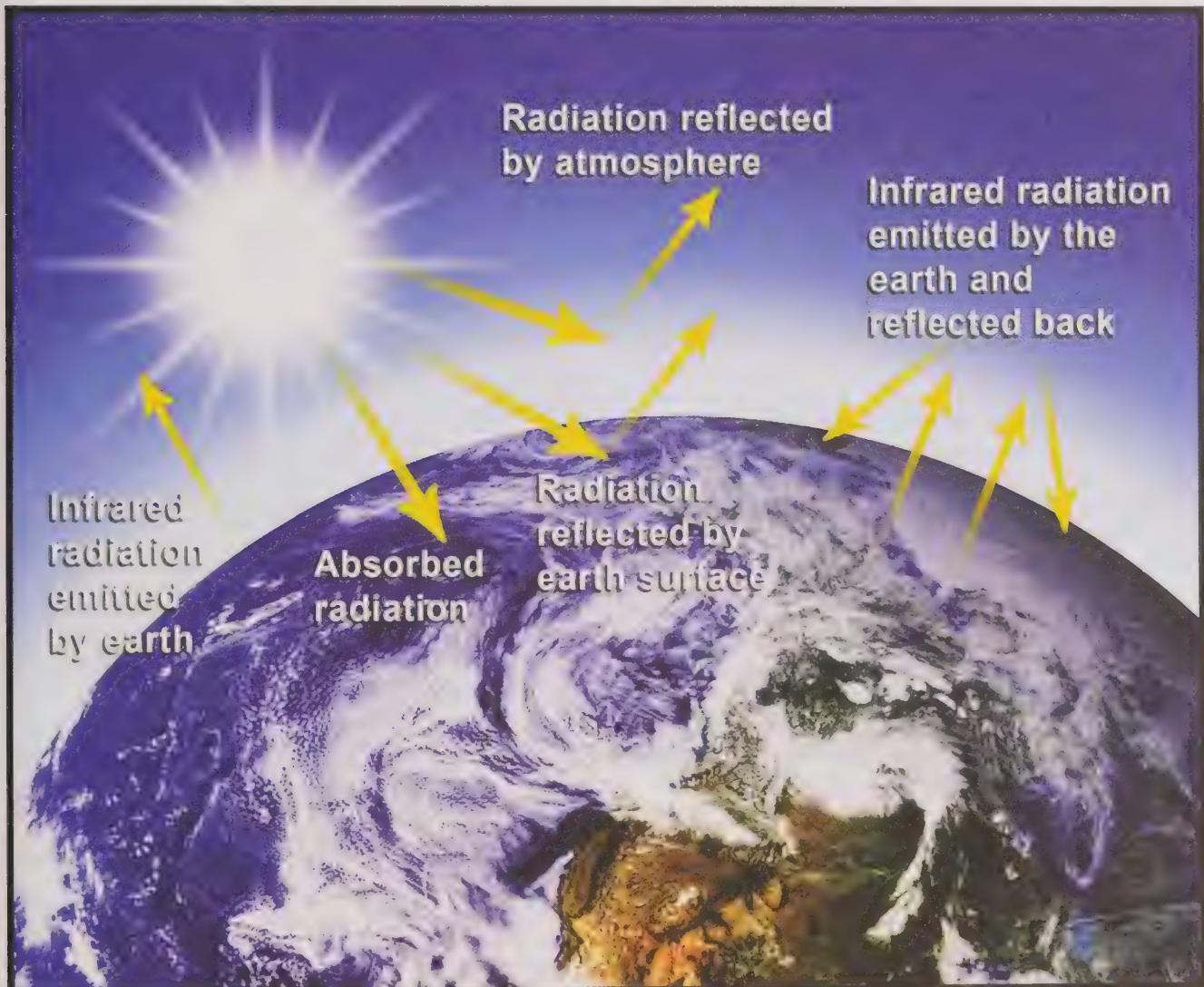
1.1.1 The greenhouse effect

The earth's atmosphere is like a blanket that keeps the planet warm. The greenhouse effect is a heat-trapping process that occurs naturally in the atmosphere. Without the greenhouse effect, the average temperature of the earth would be a frigid -19°C instead of the balmy 14°C that we currently enjoy.

The greenhouse effect is illustrated in Figure 1.1 (University Corporation for Atmospheric Research, Project Learn, http://www.ucar.edu/learn/1_3_1.htm). Incoming energy from the sun penetrates the atmosphere to warm the earth. The planet then radiates heat back out toward space. Some of the outgoing heat is absorbed by GHGs in the atmosphere and re-emitted back to earth, keeping the planet warm.

Figure 1.1

The greenhouse effect



1.1.2 Important terms

It is important to understand the following terms when discussing climate change:

Weather is the state of the atmosphere at a given time and place.⁴ It refers to the temperature, air pressure, humidity, wind, cloudiness and precipitation of a region over a short period of time.

Climate describes the average weather that a region experiences, usually calculated over a 30-year period.⁵ It encompasses all aspects of weather—temperature, air pressure, humidity, wind, cloudiness and precipitation—and is a guide for what kind of weather to expect. While weather can vary dramatically from one day to the next, climate cannot.

Climate change refers to change in average weather patterns⁶ and can be caused by both natural processes and human activities. In the past, the earth's climate has been affected by natural factors such as changes in solar output and the discharge of volcanic ash. In fact, the planet has been through many periods of cooling and warming. The last period of major cooling ended about 10,000 years ago.

Global warming refers to an increase in average global surface temperature.⁷

Greenhouse gases (GHGs) is the name given to a group of gases released to the atmosphere that contribute to the greenhouse effect. Some of these gases are produced by both human and natural processes, while others are entirely human-made. A large proportion of human-made GHGs are produced by activities that require combustion of fossil fuels, such as driving cars or the production of electricity.

Carbon sinks are reservoirs that absorb and sequester (store) CO₂ from the atmosphere. Examples of areas that can act as carbon sinks include forests, soils, peat, permafrost, ocean water, and carbonate deposits in the deep ocean.

4. Environment Canada, 2006, Climate Change – Overview, <http://www.ec.gc.ca/climate/overview-e.html> (accessed February 8, 2007).

5. *Ibid.*

6. *Ibid.*

7. Office of the Auditor General of Canada, 2006, "Climate Change – An Overview," Report of the Commissioner of the Environment and Sustainable Development, 2006, http://www.oag-bvg.gc.ca/internet/English/oag-bvg_e_14549.html (accessed April 11, 2007).

Carbon neutral is a term applied to individuals, businesses, or organizations whose activities contribute zero net greenhouse gas emissions to the atmosphere. This requires that any GHG emissions produced by an activity must be offset with emissions reductions or carbon absorption in some other activity.

Carbon offset is the process of reducing or avoiding GHG emissions in one place in order to "offset" GHG emissions occurring elsewhere.

1.1.3 Greenhouse gases

Carbon dioxide is perhaps the best-known GHG, but there are many others, such as water vapour (Text box "Water vapour"), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs).

Water vapour

The largest contributor to the natural greenhouse effect is water vapour. Human activity does not affect the amount of water vapour in the atmosphere to any significant degree. As air warms, however, it can hold more water vapour. Of course, there is a limit to the amount of water vapour that the atmosphere can hold. When the air becomes saturated, clouds form and the water vapour returns to the earth as rain.

Clouds play an interesting role in regulating the temperature of the earth. They prevent incoming solar radiation from reaching the planet's surface, thereby cooling the earth. At the same time, clouds trap heat being emitted by the earth, thereby warming it.

It is widely accepted that global warming will increase cloud cover over the planet. It is uncertain, however, whether the increased cloud cover will result in an overall cooling or warming effect.

Source(s): Intergovernmental Panel on Climate Change, 2007, *Climate Change 2007: The Physical Science Basis: Summary for Policymakers*, <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf> (accessed February 11, 2008);

Office of the Auditor General of Canada, 2006, *Climate Change – An Overview*, Report of the Commissioner of the Environment and Sustainable Development, 2006, http://www.oag-bvg.gc.ca/internet/English/oag-bvg_e_14549.html (accessed February 25, 2008).

Most GHGs have both natural and human-induced (anthropogenic) sources (Table 1.1). For example, CO₂ is produced through the decay of plant and animal matter (natural source) and fossil fuel combustion (human-induced source). However, there are no natural sources of PFCs, HFCs nor SF₆.

How much a given mass of a GHG contributes to global warming varies with the type of gas, and so the Global Warming Potential index has been developed to place all gases on a common measurement footing. Calculating this index for different gases allows the relative contributions of all GHGs to be expressed in terms of their CO₂ equivalence. For example, CH₄ has 21 times the global warming potential (GWP) of CO₂. Some substances, such as SF₆, have GWPs thousands of times that of CO₂ and are of concern

even though they are emitted in small quantities (Table 1.2).

Historical data from ice-cores and recent observations show that over the 160 years since industrialization, GHGs have been accumulating in the earth's atmosphere (Chart 1.2). This increase in GHG concentrations means that more outgoing radiation is being trapped in the earth's atmosphere, increasing the mean temperature (Chart 1.1). There has been a 0.76°C increase in the average temperature on earth between the late 1800's (1850 to 1899) and the present day (2001 to 2005).⁸

8. Intergovernmental Panel on Climate Change, 2007, *Climate Change 2007: The Physical Science Basis: Summary for Policymakers*, <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf> (accessed February 11, 2008).

Table 1.1
Anthropogenic and natural sources of greenhouse gases

	Anthropogenic sources	Natural sources
Carbon dioxide	Fossil fuel combustion; deforestation; industrial processes.	Respiration by plants and animals; oceans; decay and fermentation of organic matter; forest and grass fires. Wetlands.
Methane	Livestock and rice cultivation; biomass burning; landfills; coal mining.	
Nitrous oxide	Fossil fuel combustion; wood combustion; nitrogenous fertilizers.	Anaerobic denitrification in soil and water.
Hydrofluorocarbons	Foam insulation; metal production; coolants in refrigerators and air conditioners.	...
Perfluorocarbons	Aluminium production; refrigeration; air conditioning; semi-conductor manufacturing.	...
Sulphur hexafluoride	Magnesium smelting; aluminium production; electrical switchgear manufacture and failure.	...

Source(s): Environment Canada, 2006, "Greenhouse Gases," Information on Greenhouse Gases and Sinks, http://www.ec.gc.ca/pdb/ghg/about/gases_e.cfm (accessed March 11, 2008); Environment Canada, Greenhouse Gas Emissions Reporting: Technical Guidance on Reporting Greenhouse Gas Emissions, 2006 Reporting Year (2005 Emissions Data), <http://www.ghgreporting.gc.ca/GHGInfo/Pages/2006Guidance-English.pdf> (accessed March 13, 2008); Intergovernmental Panel on Climate Change, 2001, "Technical Summary," Climate Change 2001: Working Group I: The Scientific Basis, <http://www.ipcc.ch/ipccreports/tar/wg1/017.htm> (accessed March 13, 2008).

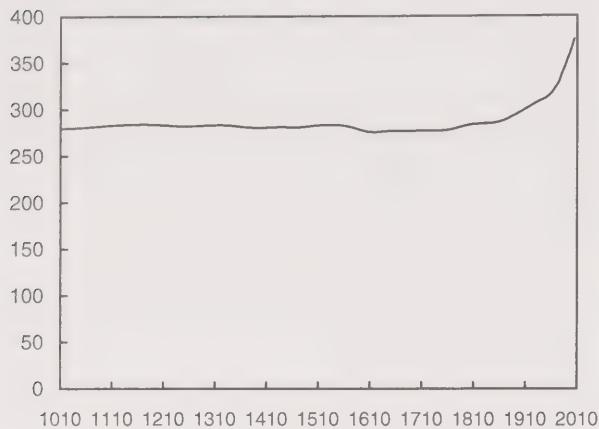
Table 1.2
Global warming potential of greenhouse gases

	100-year global warming potential
	index
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous oxide (N ₂ O)	310
Sulphur hexafluoride (SF ₆)	23,900
Hydrofluorocarbons (HFCs)	140 to 11,700
Perfluorocarbons (PFCs)	6,500 to 9,200

Source(s): Government of Canada, 2006, Greenhouse Gas, Reporting Site, Greenhouse Gas Emissions Reporting: Technical Guidance on Reporting Greenhouse Gas Emissions, 2006 Reporting Year (2005 Emissions Data), <http://www.ghgreporting.gc.ca/GHGInfo/Pages/page15.aspx> (accessed February 25, 2008).

Chart 1.2
Atmospheric carbon dioxide
concentrations, 1010 to 2004

parts per million (ppm)



Note(s): Pre-1975 data taken from Etheridge et al, 1998. Post-1975 data taken from Keeling and Whorf, 2005.

Source(s): Etheridge, D.M., L.P. Steele, R.L. Langenfelds, R.J. Francey, J.-M. Barnola and V.I. Morgan, 1998, Historical CO₂ records from the Law Dome DE08, DE08-2, and DSS ice cores, <http://cdiac.ornl.gov/trends/co2/lawdome.html> (accessed March 4, 2008). Keeling, C.D. and T.P. Whorf, 2005, Atmospheric carbon dioxide records from the South Pole, <http://cdiac.ornl.gov/trends/co2/sio-spl.htm> (accessed March 4, 2008).



1.2 Greenhouse gas emissions⁹

Consideration of greenhouse gas emission data is central to any examination of climate change. The work we do, the purchases we make and the leisure activities we enjoy all result in GHG emissions. Knowing the amount of GHGs emitted as a result of human activity is important.

Canada's 2007 National Inventory Report prepared by Environment Canada, is the most comprehensive and up to date information source on GHG emissions in Canada, presenting emissions estimates for the years 1990 to 2005. It follows the approaches and practice of the Intergovernmental Panel on Climate Change (IPCC) used by all countries to identify, quantify and reduce uncertainty of GHG estimates as much as they possibly can.

The concepts of supply and demand provide different ways of looking at the same issue. The data in the National Inventory, following the categories prescribed by the United Nations Framework Convention on Climate Change, provide the supply perspective. These data show how many emissions are produced and by whom.

9. This sub-section draws heavily on information presented in a single source. Unless otherwise indicated the data comes from Environment Canada, 2007, *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005*, Greenhouse Gas Division, Ottawa, Ontario. The complete report is available at http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm.

1.2.1 Greenhouse gas emissions, 1990 to 2005

Canada's 2007 National Inventory Report documents estimates of human-induced emissions and removals of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs).

The inventory classifies emissions into the following six categories:

- energy production and consumption
- industrial processes
- solvent and other product use
- agriculture
- waste
- land use, land-use change and forestry activities.

National picture

In 2005, Canadians emitted about 747 megatonnes of CO_2 equivalent of GHGs to the atmosphere (Chart 1.3). A megatonne of emissions is very difficult to comprehend: even one tonne of emissions, the volume of which is enough to fill an ordinary two-storey, three-bedroom house, is hard to grasp (Text box "How much is a tonne of emissions?").

How much is a tonne of emissions?

Activities that produce one tonne (t) of emissions include:

- driving a mid-size car about 5,000 km;
- 20 cars idling two minutes each a day for a year.

1,000,000 t = 1 megatonne

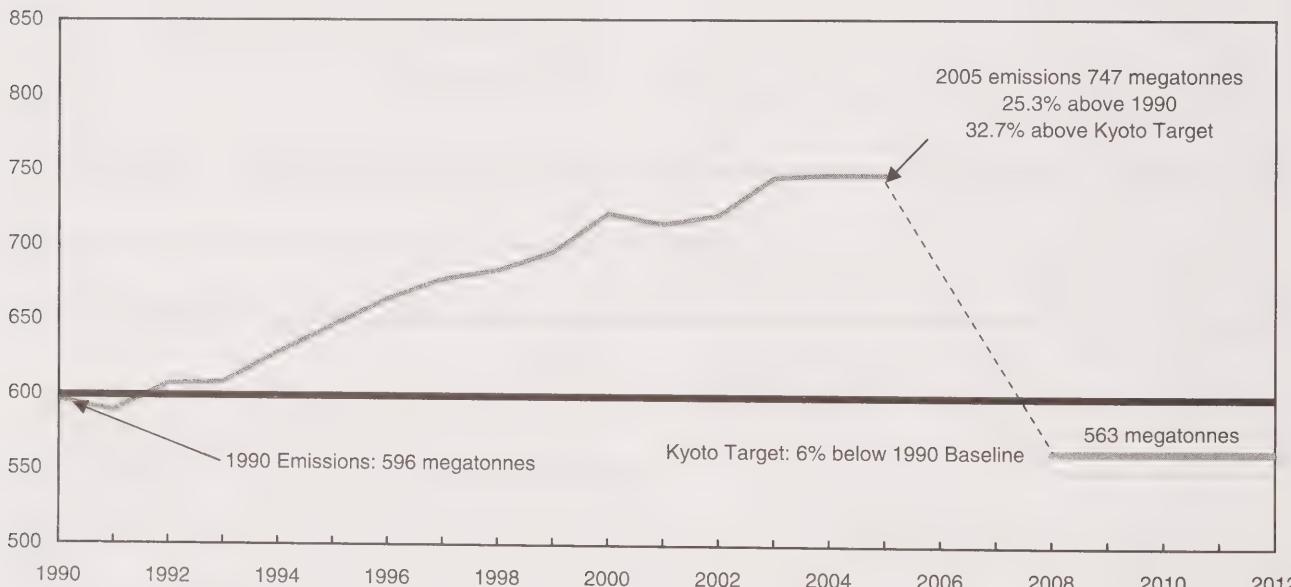
Source(s): Envirozine, Environment Canada's On-line News magazine, http://www.ec.gc.ca/envirozine/english/issues/42/feature1_e.cfm (accessed February 13, 2008).

Since 1990, when total GHG emissions were estimated at 596 Mt, levels have increased by about 25%. In 2002, Canada ratified the Kyoto Protocol and committed to lowering emissions to 6% below 1990 levels by 2008 to 2012. In 2005, however, emissions were 33% above the Kyoto target.

Carbon dioxide is by far the most common GHG emitted (Chart 1.4). The proportion that each GHG has contributed to total emissions has not changed significantly from 1990.

Chart 1.3
Greenhouse gas emissions in Canada, 1990 to 2005 and Kyoto Target

megatonnes CO₂ equivalent



Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, Ontario, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

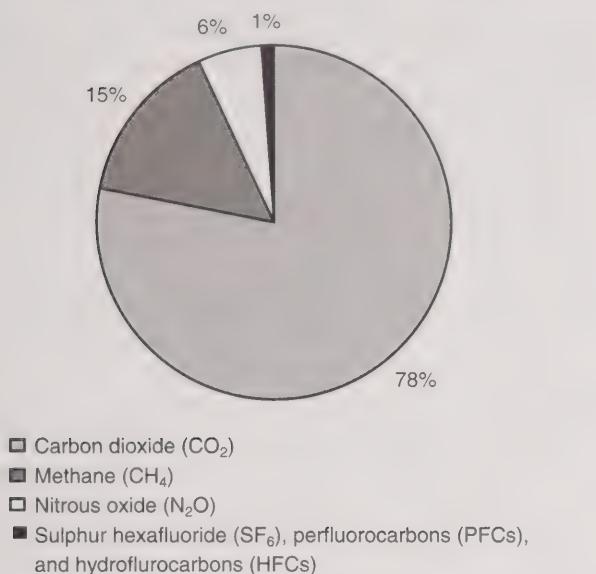
According to Environment Canada, total GHG emissions from 2003 to 2005 (Chart 1.3) stopped growing primarily as a result of a significant reduction in emissions from electricity production. This reduction was the result of reduced coal and increased hydro and nuclear generation, coupled with a reduced demand for heating fuels caused by warmer winters and a smaller increase in fossil fuel production. Canada's GHG intensity—the amount of GHGs emitted per unit of economic activity—was 6% lower in 2005 than in 2003 (Chart 1.5).

Contributions from energy production and consumption

Energy production and consumption are by far the largest source of GHG emissions in Canada, accounting for more than 80% of emissions in 2005 (Table 1.3). Energy-related contributions include emissions of GHGs from fossil fuel production and from the combustion of fossil fuels for the purposes of generating heat and transportation.

Chart 1.4

Composition of greenhouse gas emissions expressed as carbon dioxide equivalents, 2005

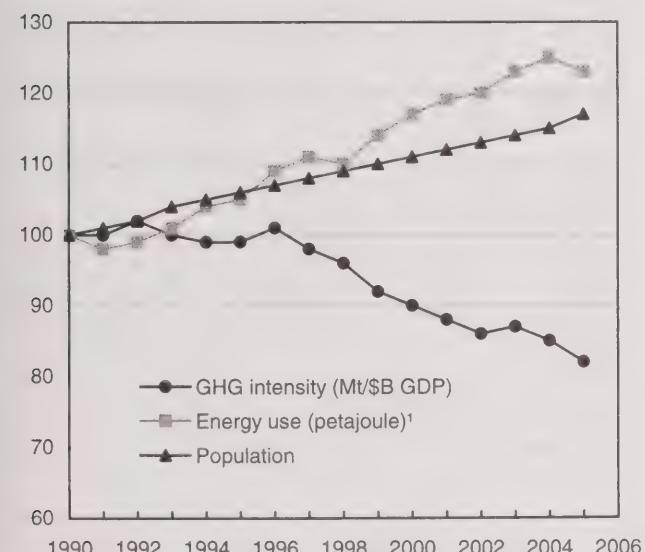


Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

Chart 1.5

Greenhouse gas emissions per unit of gross domestic product, Canada, 1990 to 2005

indexed indicators (1990=100)



1. Natural Gas and Crude Oil.

Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, Ontario, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

Direct emissions from fossil fuel combustion made up 89% of energy-related emissions in 2005 (546 Mt), while fugitive emissions (Text box "Fugitive releases") accounted for the remaining 11% (65.7 Mt). From 1990 to 2005, emissions related to fuel combustion increased 26%, while emissions from fugitive releases rose 54%.

Fugitive releases

Examples of fugitive GHG releases related to fossil fuels include:

- intentional flaring of natural gases at oil and gas production facilities;
- leakage from natural gas transmission lines and processing plants;
- accidental release from oil and gas wells;
- releases from the mining and handling of coal.

Transportation activity is a major source of emissions related to the combustion of fossil fuels, and accounted for 33% of emissions and 37% of growth in energy-related emission sources since 1990. Of particular note was the 109% increase in the emissions from light-duty gasoline trucks (from 21.3 Mt in 1990 to 44.5 Mt in 2005), reflecting the growing popularity of sport-utility vehicles, vans and light trucks. These vehicles, which emit, on average, 40% more GHG emissions per kilometre than gasoline automobiles, increased emissions by 23.2 Mt from 1990 to 2005.

- Neitzert, F., K. Olsen, and P. Collas. 1999. *Canada's Greenhouse Gas Inventory-1997 Emissions and Removals with Trends*, Environment Canada, Ottawa.
- Nyboer, J. and K. Tu. 2006. *GHG Emission Trend Analysis in the Fossil Fuel Production Industries*, Draft report, Canadian Industrial Energy End-Use Data and Analysis Centre, Simon Fraser University, Burnaby, British Columbia, Canada.
- Statistics Canada, 2007, *Report on Energy Supply-demand in Canada 2005*, Catalogue no. 57-003-X, (accessed December 18, 2007).

Mining and oil and gas extraction activities accounted for only 2.6% of energy-related emissions in 2005, but their increase from 1990 levels was 152%. From 1990 to 2000 the energy requirements per barrel of conventional light/medium oil extracted nearly doubled.^{10,11} At the same time, highly energy- and GHG-intensive synthetic oil production from oilsands has become increasingly competitive with conventional oil extraction. These trends contributed significantly to the rapid rise in emissions attributable to mining and oil and gas extraction activities from 1990 to 2005.

In 2008, oilsands producers intend to invest \$19.7 billion, up 23% after a 31% hike in 2007. This exceeds the total investment plans of \$19.6 billion by all manufacturing industries (Chart 1.6). Oilsands investment has surpassed manufacturing because of its rapid growth, not because manufacturing has been weak. Just a decade ago, oilsands investment was less than one-tenth capital outlays by manufacturers (\$1.4 billion versus \$21.6 billion in 1998).

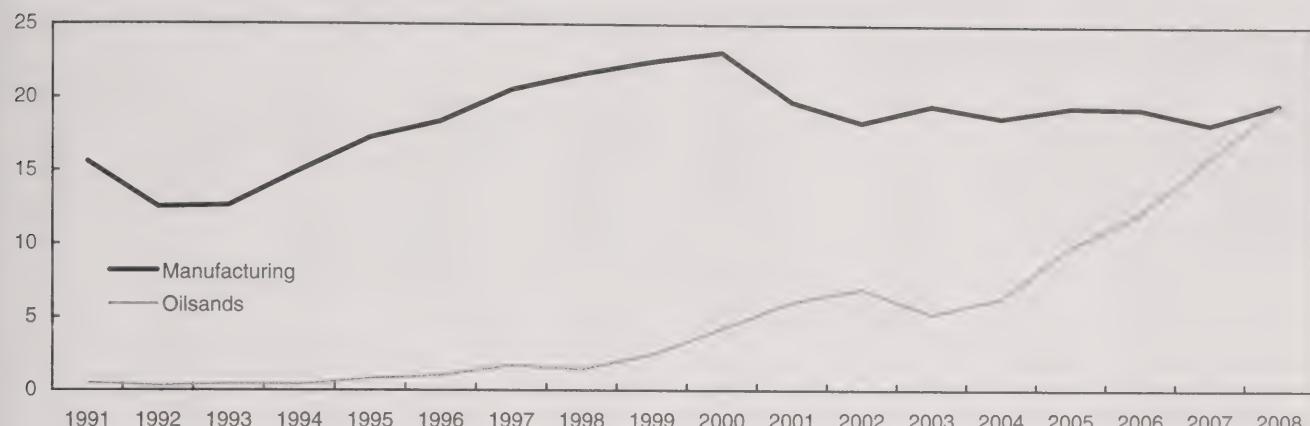
Greenhouse gas emissions from electricity and heat production accounted for 129 Mt, or 21% of energy-related emissions, and 25% of emission growth in this area from 1990 to 2005. The increase over this period was driven by a rising demand for electricity and by an increase in the use of fossil fuels, such as coal for electricity generation, relative to other non-emitting sources, including nuclear and hydro. The contribution of other renewables, mostly new wind installations, increased more than 500% from 2000 to 2005. These electricity sources, however, contribute minimally to the overall supply mix (0.3% in 2005).

Canada's report on energy supply and demand documents that 7,764 petajoules of energy in the form of oil, gas and electricity were exported in 2005.¹² Production of this energy resulted in 72.8 Mt of GHGs, almost 10% of all GHG emissions.

Chart 1.6

Investment¹ in oilsands and manufacturing, 1991 to 2008

\$ billions (current dollars)



1. Data prior to 2007 are actual, 2007 data are preliminary actual, and 2008 are investment intentions (based on data available March 7, 2008).

Source(s): Statistics Canada, 2008, Canadian Economic Observer, vol. 21, no. 3, Catalogue no. 11-010-X and CANSIM tables 029-0007 to 029-0009.

Non-energy emissions

Non-energy industrial processes accounted for 7% of overall GHG emission in 2005. The marked decrease in emissions from the chemical industry after 1995 (Table 1.3) reflects the introduction of a GHG emission abatement system by Canada's only adipic acid producer in 1997. Adipic acid is used primarily in the production of nylon and other plastics.

Emissions from Canada's approximately 250 thousand farms accounted for 57 Mt of GHG emissions, or 8% of total emissions in 2005. This was an increase of 11 Mt, or 24%, from 1990. Under the reporting guidelines, the only emissions attributed to agriculture are from non-energy sources (51% are N_2O and 49% are CH_4). Agricultural emissions related to burning of fossil fuels for energy—including driving tractors, heating and drying grain—are reported under energy production and use.

Greenhouse gas emissions from waste management increased 22% between 1990 and 2005. In 2005, these emissions represented 3.7% of total GHG

emissions, compared with 3.9% in 1990. Of the 28 Mt of emissions from this sector in 2005, solid waste disposal on land, which includes municipal solid waste landfills and wood waste landfills, accounted for 27 Mt. Methane emissions produced by the decomposition of biomass in municipal solid waste landfills made up 96% of the emissions from this sector.

Land use, land-use change and forestry activities can emit greenhouse gases into the atmosphere or remove them into sinks. In brief, vegetated land absorbs CO_2 , whereas removal of that vegetation releases the stored CO_2 into the atmosphere.

These emissions and removals are estimated and reported for four categories of managed lands: forest land, cropland, wetlands and settlements. Net emissions, calculated as the sum of emissions and removals, are negative in some years and positive in others. In 2005, net emissions amounted to -17 Mt. As per United Nations Framework on Climate Change reporting requirements, these estimates are not included in the national totals.

Table 1.3
Canada's greenhouse gas emissions

	1990	1995	2000	2003	2004	2005
kilotonnes CO ₂ equivalent						
Green household gas source and sink categories						
Total 1	596,000	646,000	721,000	745,000	747,000	747,000
Energy	473,000	514,000	592,000	613,000	608,000	609,000
Stationary combustion sources	282,000	294,000	344,000	360,000	349,000	346,000
Electricity and heat generation	95,300	101,000	132,000	135,000	127,000	129,000
Fossil fuel industries	52,000	54,000	67,000	74,000	72,000	73,000
Petroleum Refining and Upgrading	16,000	14,000	14,000	19,000	18,000	18,000
Fossil Fuel Production	36,000	40,000	53,000	54,000	54,000	55,000
Mining and oil and gas extraction	6,180	7,850	10,400	15,700	14,800	15,600
Manufacturing industries	54,700	52,900	53,000	49,300	50,900	45,900
Iron and steel	6,490	7,040	7,190	6,370	6,480	6,520
Non-ferrous metals	3,180	3,090	3,190	3,200	3,230	3,190
Chemical	7,090	8,450	7,850	5,810	6,760	5,350
Pulp and paper	13,600	11,700	11,000	8,990	9,310	7,340
Cement	3,690	3,670	3,890	4,080	4,210	4,580
Other manufacturing	20,600	19,000	19,900	20,800	20,900	18,900
Construction	1,880	1,180	1,080	1,300	1,350	1,310
Commercial and institutional	25,800	29,000	33,200	37,900	37,900	36,800
Residential	44,000	45,000	45,000	45,000	43,000	42,000
Agriculture and forestry	2,420	2,790	2,570	2,210	2,100	1,950
Transportation 2	150,000	160,000	180,000	190,000	190,000	200,000
Domestic aviation	6,400	5,900	6,600	7,300	7,900	8,700
Road transportation	101,000	112,000	122,000	129,000	133,000	135,000
Light-Duty gasoline vehicles	47,200	45,700	43,300	42,600	42,400	41,200
Light-Duty gasoline trucks	21,300	28,700	37,900	41,700	43,300	44,500
Heavy-Duty gasoline vehicles	8,050	6,270	5,450	6,230	6,600	6,510
Motorcycles	151	125	163	233	252	260
Light-Duty diesel vehicles	363	335	362	408	441	443
Light-Duty diesel trucks	724	1,360	1,730	1,930	2,040	2,200
Heavy-Duty diesel vehicles	21,200	27,100	32,100	35,000	37,400	39,000
Propane and natural gas vehicles	2,200	2,100	1,100	820	860	720
Railways	7,000	6,000	7,000	6,000	6,000	6,000
Domestic marine	5,100	4,400	5,100	6,200	6,700	6,500
Others	30,000	30,000	40,000	40,000	40,000	40,000
Off-Road Gasoline	7,000	7,000	8,000	8,000	8,000	7,000
Off-Road Diesel	20,000	20,000	20,000	20,000	20,000	20,000
Pipelines	6,900	12,000	11,300	9,110	8,520	10,100
Fugitive sources	42,700	57,000	64,700	65,900	66,200	65,700
Coal mining	2,000	2,000	900	700	700	700
Oil and natural gas	40,700	55,300	63,700	65,100	65,500	65,000
Oil	4,180	5,150	5,430	5,780	5,940	5,660
Natural Gas	12,900	16,500	19,400	20,100	20,400	20,800
Venting	19,300	28,600	33,500	33,700	33,700	33,000
Flaring	4,400	5,100	5,400	5,600	5,400	5,500
Industrial processes	53,500	55,700	50,200	50,600	55,400	53,300
Mineral products	8,300	8,800	9,600	9,100	9,500	9,500
Cement production	5,400	6,100	6,700	6,800	7,100	7,200
Lime production	1,700	1,800	1,900	1,600	1,800	1,700
Mineral product use ³	1,090	878	1,020	612	590	599
Chemical industry	16,000	17,000	7,400	7,400	9,800	8,900
Ammonia production	3,900	5,300	5,300	5,000	5,500	5,000
Nitric acid production	1,010	1,000	1,230	1,260	1,230	1,260
Adipic acid production	11,000	11,000	900	1,100	3,100	2,600
Metal production	19,500	19,200	18,900	17,200	17,600	16,200
Iron and steel production	7,060	7,880	7,900	7,040	8,160	7,010
Aluminum production	9,300	9,200	8,200	7,700	7,300	7,900
SF ₆ used in magnesium smelters and casters	3,110	2,110	2,780	2,480	2,190	1,300
Consumption of halocarbons and SF₆	1,800	2,000	4,500	6,000	5,500	6,100
Other and undifferentiated production	8,300	8,700	9,700	11,000	13,000	13,000
Solvent and other product use	170	210	240	220	210	180

See footnotes at the end of the table.

Table 1.3 – continued

Canada's greenhouse gas emissions

	1990	1995	2000	2003	2004	2005
kilotonnes CO ₂ equivalent						
Agriculture	46,000	50,000	53,000	54,000	56,000	57,000
Enteric fermentation	18,000	21,000	22,000	23,000	24,000	25,000
Manure management	6,700	7,400	7,800	8,100	8,400	8,600
Agricultural soils	21,000	22,000	23,000	23,000	24,000	23,000
Direct sources	12,000	12,000	13,000	13,000	13,000	13,000
Pasture, range, and paddock manure	3,200	3,700	3,900	4,000	4,300	4,400
Indirect sources	5,000	6,000	6,000	6,000	6,000	6,000
Waste	23,000	25,000	26,000	27,000	28,000	28,000
Solid waste disposal on land	22,000	24,000	25,000	26,000	26,000	27,000
Wastewater handling	780	810	880	910	930	930
Waste incineration	400	350	250	230	230	240
Land use, land—use change and forestry	-120,000	150,000	-110,000	22,000	81,000	-17,000
Forest Land	-150,000	140,000	-120,000	11,000	70,000	-27,000
Cropland	14,000	7,300	3,700	1,400	1,200	520
Grassland	...	...	...	...	...	...
Wetlands	5,000	3,000	2,000	2,000	2,000	2,000
Settlements	9,000	9,000	8,000	8,000	8,000	8,000

1. National totals exclude all GHGs from the land use, land—use change and forestry sector.

2. Emissions from fuel ethanol are reported within the gasoline transportation subcategories.

3. The category Mineral product use includes CO₂ emissions from the use of limestone and dolomite, soda ash, and magnesite.

Note(s): Classification according to United Nations Framework Convention on Climate Change. Totals may not add up due to rounding.

Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, Ontario, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed February 25, 2008).

Emissions and demand

Typically, emissions are reported from the supply perspective as detailed above (Table 1.3), showing what emissions are produced and by whom. While this supply perspective is valuable, it is also useful to look at emissions from the perspective of the demand for products and services.

When businesses meet the demand for goods and services, GHG emissions are an unfortunate by-product of the production processes that ensue. From the final demand perspective (Text box "Final demand"), GHGs emitted by industry are attributed to the end-user of the industrial goods and services rather than to industries themselves. This can provide insights into emissions that are otherwise not apparent.

Canada is a trading nation, producing a significant volume of exports. The proportion of industrial GHG emissions associated with the production of goods and services for export increased from 1990 to 2003. In 2003, exports accounted for 45% of industrial

emissions of GHGs, up from 37% in 1990. Over the same period, GHG emissions required to satisfy domestic demands increased by 10% (Table 1.4) in spite of a population that increased by 14.4%. ¹³ This means that 76% of the increase in domestic industrial emissions from 1990 to 2003 was due to the production of goods and services for export.

What is behind this increase in GHG emissions from the production of goods and services for export? The largest source of this growth was the production of fossil fuels, including coal, crude oil and natural gas, for export. In both 1990 and 2003, the production of these fuels for export resulted in more GHG emissions than the production of any other exported commodity (Table 1.5). Over the period, as worldwide demand for fuels surged, GHG emissions from the production of exported fuels jumped 146%, and the contribution of this sector increased from 16.5% to 26.6% of all exports.

13. CANSIM Table 051-0001.

Final demand

Domestic demand

- **Personal expenditure:** the purchase of commodities, commodity taxes, wages and salaries and supplementary labour income of persons employed by the personal sector. Includes expenditures by individuals, families and private non-profit organizations.
- **Construction, machinery and equipment:** the value of a producer's acquisitions, minus disposals, of fixed assets during the accounting period plus certain additions to the value of non-produced assets (such as subsoil assets or major improvements in the quantity, quality or productivity of land) realized by the productive activity of institutional units.
- **Government expenditure:** economic activities of the federal government (including defence), the provincial and territorial governments, local (municipal) governments, universities, colleges, vocational and trade schools, publicly funded hospitals and residential care facilities, and publicly funded schools and school boards.
- **Inventories:** stocks of outputs that are still held by the units that produced them prior to their being further processed, sold or delivered to other units or used in other ways, and stocks of products acquired from other units that are intended to be used for intermediate consumption or for resale without further processing.

External demand

- **Exports:** The sale of goods and services to buyers in other countries.

Source(s): Statistics Canada, Environment Accounts and Statistics Division.

Table 1
Methane (CH₄) industrial greenhouse gas emissions by final demand category, 1990 and 2003^P

	1990	2003 ^P	Percentage change 1990 to 2003	Share of total 1990	Share of total 2003 ^P
	kilotonnes		percent		
Internal demand					
Personal expenditure	299,854	329,264	9.8	63.2	55.3
Construction	189,168	217,366	14.9	39.9	36.5
Machinery and equipment	43,634	45,196	3.6	9.2	7.6
Government	11,004	10,696	-2.8	2.3	1.8
Inventories	42,489	44,532	4.8	9.0	7.5
	13,559	11,473	-15.4	2.9	1.9
External demand					
Exports	174,506	266,619	52.8	36.8	44.7
Total domestic industrial emissions	474,360	595,882	25.6	100.0	100.0

Note(s): Totals may not add up due to rounding

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Material and Energy Flow Accounts, special tabulation.

Table 1.5

Domestic industrial greenhouse gas emissions associated with the production of exports, 1990 and 2003^P

	1990	2003 ^P	Share of total 1990	Share of total 2003 ^P
	kilotonnes		percent	
Mineral fuels	28,833	70,935	16.52	26.61
Primary metal products and other metal products	16,975	20,621	9.73	7.73
Pulp and paper products	19,474	18,761	11.16	7.04
Agricultural products	16,441	17,820	9.42	6.68
Chemicals, pharmaceuticals and chemical products	12,756	16,754	7.31	6.28
Transportation and storage	10,078	15,450	5.78	5.79
Motor vehicles, other transportation equipment and parts	10,926	15,130	6.26	5.67
Wholesaling, retailing and transportation margins	11,895	14,595	6.82	5.47
Food products	6,377	14,407	3.65	5.40
Petroleum and coal products	10,538	13,271	6.04	4.98
Lumber, wood products, furniture and fixtures	4,022	7,924	2.31	2.97
Other utilities	2,577	7,570	1.48	2.84
Non-metallic minerals, metal ores and concentrates	6,923	6,483	3.97	2.43
Machinery and equipment	2,295	4,243	1.32	1.59
Business and computer services	736	4,187	0.42	1.57
Non-metallic mineral products	1,919	3,386	1.10	1.27
Electrical, electronic and communication products	1,672	2,855	0.96	1.07
Leather, rubber, and plastic products	1,383	2,613	0.79	0.98
Textile products, hosiery, clothing and accessories	2,076	1,910	1.19	0.72
Other finance, insurance, and real estate services	887	1,726	0.51	0.65
Other manufactured products	1,382	1,393	0.79	0.52
Fish, seafood and trapping products	301	1,258	0.17	0.47
Other services	774	1,136	0.44	0.43
Printing and publishing	196	603	0.11	0.23
Beverages and tobacco products	759	395	0.44	0.15
Communications services	303	385	0.17	0.14
Forestry products	99	283	0.06	0.11
Private education services	83	206	0.05	0.08
Sales of other government services	33	123	0.02	0.05
Accommodation services and meals	1,779	119	1.02	0.04
Services incidental to mining	0	62	0.00	0.02
Health and social services	12	15	0.01	0.01
Total	174,506	266,619	100.00	100.00

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Material and Energy Flow Accounts, special tabulation.

1.2.2 Putting greenhouse gas emissions into context

International picture

In terms of growth in GHG emissions, Canada ranked first among the G8 countries over the period 1990 to 2004 (Chart 1.7).

Several factors explain why Canada's emissions rose more quickly than those of many other countries. Relative to most other developed countries, Canada had a high rate of population growth. Canada's population grew by 16.4% from 1991 to 2006, compared with 7.6% for France, 5.5% for the United Kingdom, and 3.0% for Italy and Germany.¹⁴ At 18.3%, population growth in the United States is comparable to that in Canada. Canada's economy also grew

impressively, with a 58.6% increase in gross domestic product from 1991 to 2006.¹⁵

Provincial picture

In 2005, about 546 Mt (or 73%) of Canada's GHG emissions were from the combustion of fossil fuels. This is an increase of 26% in emissions from fuel combustion since 1990. The jurisdictions with the highest percent increase in GHG emissions over this period were Saskatchewan (60.9%) and Alberta (37.4%).

Quebec, with its abundant hydro-generated electricity, had the smallest increase in emissions (4.8%). Collectively, the Yukon, Northwest Territories and Nunavut showed a net decrease in emissions (-4.1%), largely as a result of decreases in combustion emissions from electricity and heat generation in the Yukon.

14. OECD Labour Force Statistics, 2006 Edition, <http://stats.oecd.org/WBOS/>, (accessed January 10, 2008).

15. CANSIM table 384-0002, chained 2002 dollars.

Alberta had the highest total emissions of all provinces and territories in 2005 (Chart 1.8). Known for its abundant fossil fuel resources, it provided 64% of Canada's primary energy production in 2005. With 10.2% of the population,¹⁶ Alberta generated 16.1% of Canada's gross domestic product (GDP).¹⁷ From 1990 to 2005, provincial GDP¹⁸ increased 74.3% and GHG emissions increased 37.4% to 233 Mt. The province's GHG emissions are dominated by emissions related to electricity and heat generation because of the high share of coal-fired thermal electricity generation in the province.

In 2005, Ontario was Canada's most populated province, with 12.6 million people (38.9% of the total). It generated 201 Mt of GHGs (27.2% of Canada's total GHG emissions) and \$510.7 billion of GDP (39.0% of the country's total). From 1990 to 2005, Ontario's emissions increased 25.8 Mt (14.7%), while

GDP increased 51.9%. Over 90% of Ontario's GHG emissions are attributable to the energy (82%) and industrial processes (9.4%), with the majority of the remainder coming from agriculture (5.0%) and waste (3.5%).

A common way of showing GHG emissions is by looking at per capita emissions (Chart 1.9). Dividing Canada's total emissions of 747 Mt for 2005 by its population of 32 million, we see that approximately 23 tonnes of GHG emissions can be attributed to each Canadian that year. Per capita emissions are comparable in the United States (24.4 t), but are markedly less in Germany (12.1 t), the United Kingdom (10.9 t), Japan (10.6 t) and France (9.2 t).^{19, 20}

16. CANSIM table 051-0001.

17. CANSIM table 384-0002, current prices.

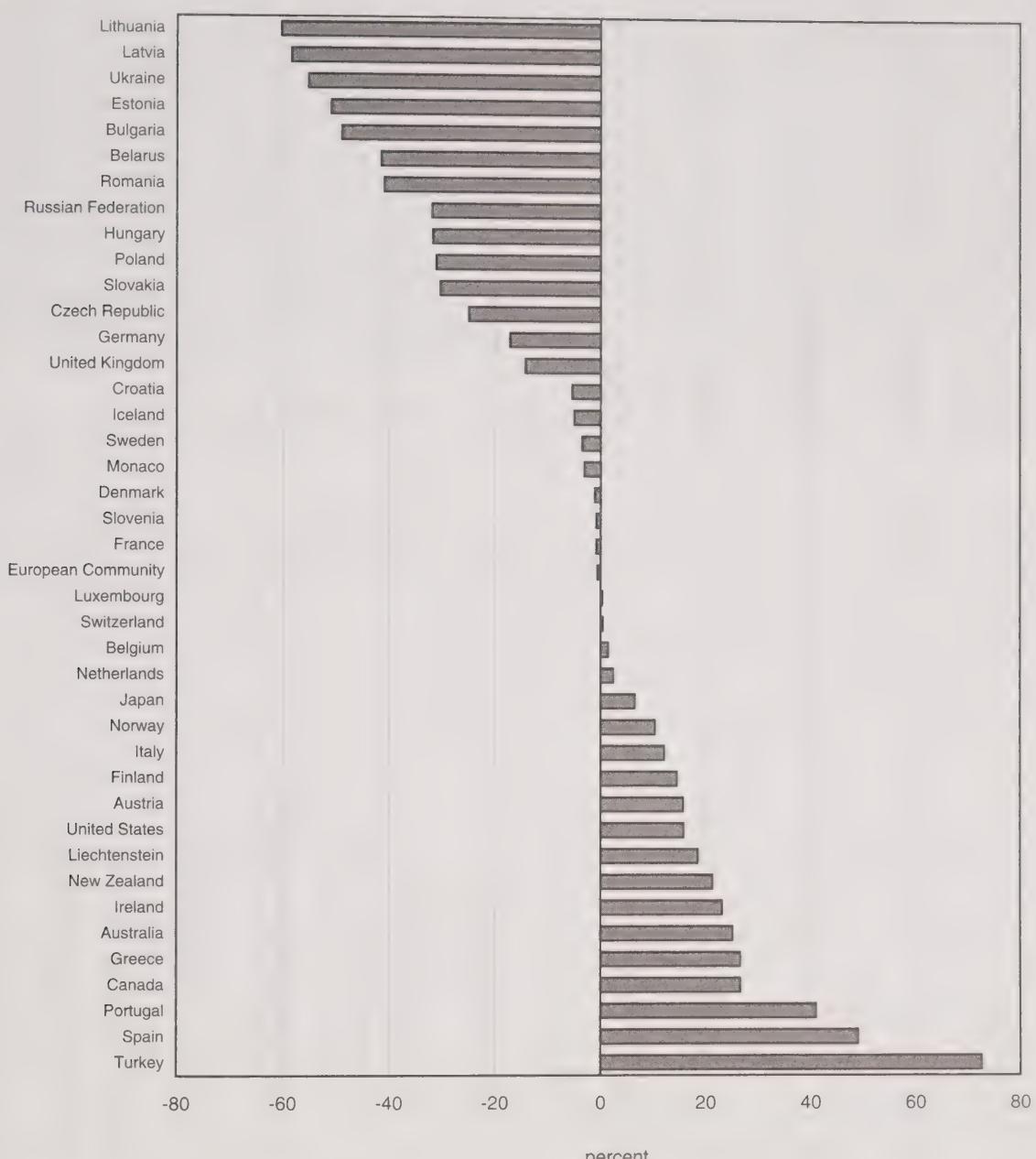
18. CANSIM table 384-0002, chained 2002 dollars.

19. 2005 GHG emissions taken from United Nations Framework Convention on Climate Change GHG emission profiles for Annex 1 Parties http://unfccc.int/ghg_emissions_data/ghg_data_from_unfccc/ghg_profiles/items/3954.php, accessed January 11, 2008.

20. Population data to calculate per capita emissions is taken from OECD Labour Force Statistics, 2006 Edition, <http://stats.oecd.org/WBOS/>, (accessed January 10, 2008).

Chart 1.7

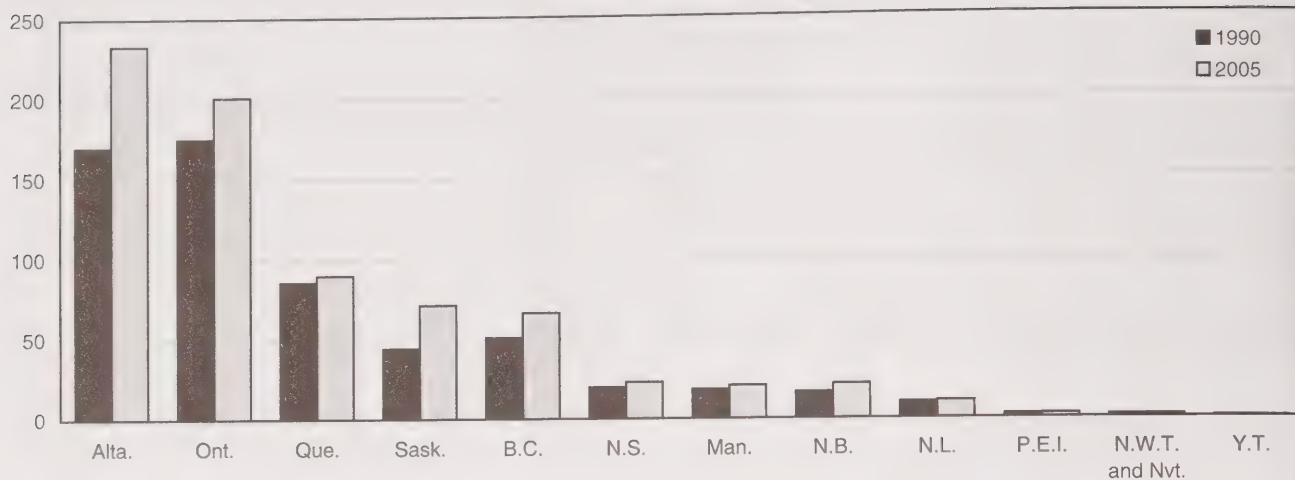
Percentage change in greenhouse gas emissions, 1990 to 2004



Note(s): These aggregate estimates are based on data from 39 Parties that submitted inventories to the UNFCCC in 2006, excluding CO₂ emissions and removals from land-use, land-use change and forestry.

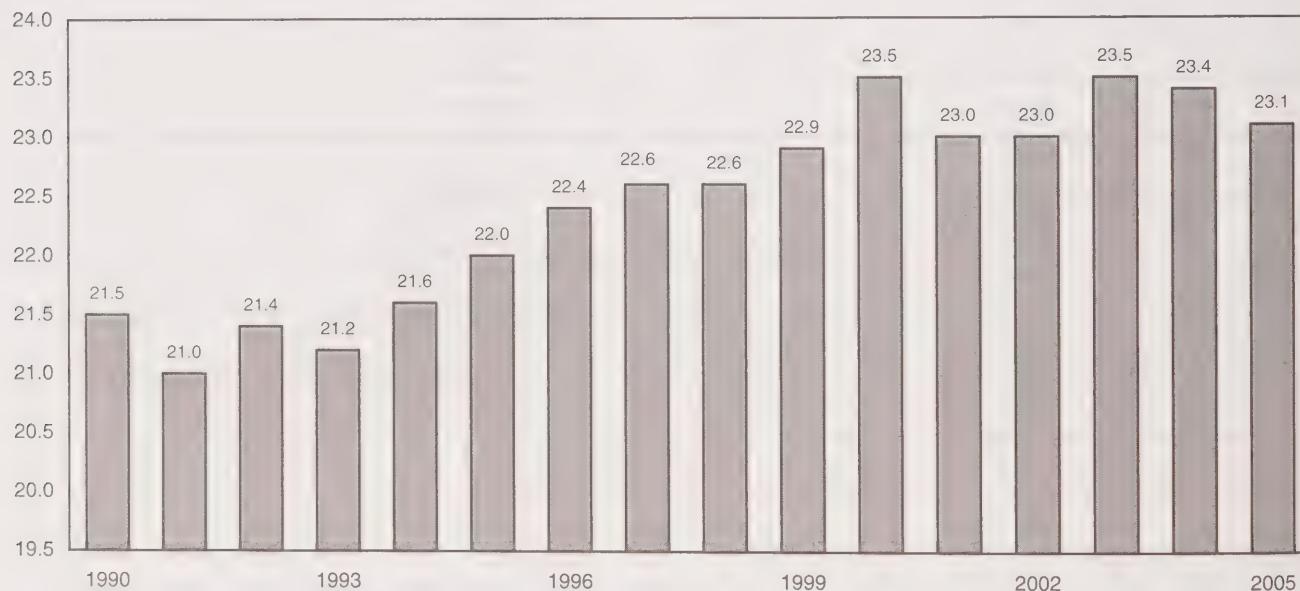
Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990-2005, Greenhouse Gas Division, Ottawa, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

Chart 1.8
Greenhouse gas emissions by province and territory, 1990 and 2005

megatonnes CO₂ equivalent

Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

Chart 1.9
Per capita greenhouse gas emissions for Canada, 1990 to 2005

tonnes CO₂ equivalent per capita

Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).



Adult polar bear and cub, Akpatok Island, Ungava Bay, Nunavut, Brenda Saunders, 2007

1.3 Climate change impacts

Climate change is predicted to affect all Canadians to a greater or lesser extent as a result of its impact on their environment, health and economy. Climate changes are expected to vary regionally. While it is not possible to predict changes with certainty, there is a very high degree of agreement among scientists that changes are already occurring and that further changes will occur.²¹ Expected changes in Canada include warmer winters, more frequent summer heat waves, changes in precipitation, changes in wind patterns, and an increased frequency of severe storms. Warming is expected to be most pronounced in arctic regions, causing permafrost to melt and glaciers to retreat more quickly.²²

Canadians will face challenges in dealing with and adapting to the effects of climate change. Regional droughts may result in water shortages; rising sea levels and heavy precipitation events may lead to greater flood damage; warmer temperatures will favour more frequent thunderstorms and tornadoes.²³

1.3.1 Canada's climate

Climate and weather vary greatly across Canada's landscape. Long-term trends in weather elements such as temperature, precipitation, wind patterns, humidity and sunshine form a region's climate. These variables are measured systematically at weather stations, and collected observations, averaged over a minimum period of 30 consecutive years, produce 'normals' for each of the elements of climate. These climate normals are updated at the beginning of each decade.

Canadians experience dramatic changes in temperature, precipitation and other weather conditions from one season to the next (Table 1.6). Latitude, proximity to large bodies of water and altitude are some of the factors that influence climate and account for differences across regions.

Weather is variable—rain one day can give way to sun the next. In a given month, there may be an abnormal number of storms, heavy rain, snow or heat waves. Such weather extremes cannot be taken as evidence of climate change; extremes are a normal feature of climate.

Climate variability indicates departures from climate normals over time. Climatic shifts—changes in the long-term weather characteristics of a region—have occurred repeatedly over the billions of years of the earth's history. Nevertheless, much evidence points to the fact that the world is warming at a rate faster than

21. Solomon, S. et al., 2007, "Technical Summary," *Climate Change 2007: The Physical Science Basis, Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al. (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, <http://www.ipcc.ch/> (accessed January 11, 2007).

22. Field, C.B. et al., 2007, "North America," *Climate Change 2007: Impacts Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry et al. (eds.), Cambridge University Press, Cambridge, <http://www.ipcc.ch/> (accessed January 11, 2007).

23. Environment Canada, 2005, *Climate Change: Overview*, http://www.ec.gc.ca/climate/overview_science-e.html (accessed February 13, 2007).

during any other recent period, and that this change is related to human activity.²⁴

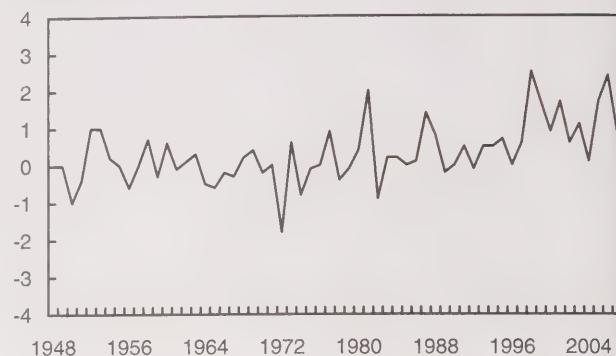
Climate trends

In recent decades, Canada has experienced warmer average temperatures. The trend over the period 1948 to 2007 shows a 1.4°C increase when looking at annual temperature departures from the 1951 to 1980 climate normal (Chart 1.10).

24. Solomon, S. et al., 2007, "Technical Summary," *Climate Change 2007: The Physical Science Basis, Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al. (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, <http://www.ipcc.ch/> (accessed January 11, 2007).

Chart 1.10
Annual national temperature departures

degrees Celsius



Note(s): Departures from 1951 to 1980 temperature average. An increasing trend of 1.4°C with a 90% confidence interval of 0.7°C to 1.7°C was detected.

Source(s): Environment Canada, Meteorological Service of Canada, Climate Research Branch, 2008, Climate Trends and Variations Bulletin for Canada, Annual 2007, http://www.msc.ec.gc.ca/ccrm/bulletin/archive_e.cfm (accessed January 11, 2008).

Table 1.6
Average temperature and precipitation, selected weather stations, 1971 to 2000

	Average daily temperature				Average annual temperature	Total average precipitation				
	January	April	July	October		January	April	July	October	
	degrees Celsius					millimetres				
St. John's, Newfoundland and Labrador	-4.8	1.6	15.4	6.9	4.7	150.0	121.8	89.4	161.9	1,513.7
Charlottetown, Prince Edward Island	-8.0	2.7	18.5	7.8	5.3	106.4	87.8	85.8	108.6	1,173.3
Halifax, Nova Scotia	-6.0	4.0	18.6	8.3	6.3	149.2	118.3	102.2	128.7	1,452.2
Fredericton, New Brunswick	-9.8	4.3	19.3	7.0	5.3	109.6	87.4	87.1	97.7	1,143.3
Montréal, Quebec	-10.4	5.5	20.5	7.5	5.8	79.8	86.0	98.1	88.5	1,046.2
Kuujjuaq, Quebec	-24.3	-9.1	11.5	-0.7	-5.7	33.2	27.3	59.2	51.9	526.8
Ottawa, Ontario	-10.8	5.7	20.9	7.8	6.0	70.2	72.4	90.6	79.4	943.5
Thunder Bay, Ontario	-14.8	2.9	17.6	5.0	2.5	31.3	41.5	89.0	62.6	711.6
Toronto, Ontario	-6.3	6.3	20.8	8.9	7.5	52.2	68.4	74.4	64.1	792.7
Winnipeg, Manitoba	-17.8	4.0	19.5	5.3	2.6	19.7	31.9	70.6	36.0	513.7
Churchill, Manitoba	-26.7	-9.7	12.0	-1.7	-6.9	16.9	19.0	56.0	46.9	431.6
Regina, Saskatchewan	-16.2	4.5	18.8	4.8	2.8	14.9	23.5	64.4	21.8	388.1
Saskatoon, Saskatchewan	-17.0	4.4	18.2	4.5	2.2	15.2	23.9	60.1	16.7	350.0
Calgary, Alberta	-8.9	4.6	16.2	5.4	4.1	11.6	23.9	67.9	13.9	412.6
Edmonton, Alberta	-13.5	4.3	15.9	4.3	2.4	22.7	26.3	95.2	19.8	482.7
Vancouver, British Columbia	3.3	9.2	17.5	10.1	10.1	153.6	84.0	39.6	112.6	1,199.0
Prince George, British Columbia	-9.6	5.2	15.5	4.6	4.0	52.4	32.2	63.5	57.9	600.8
Whitehorse, Yukon Territory	-17.7	0.9	14.1	0.6	-0.7	16.7	7.0	41.4	23.8	267.4
Inuvik, Northwest Territories	-27.6	-12.8	14.2	-8.2	-8.8	13.8	10.5	33.2	28.0	248.4
Yellowknife, Northwest Territories	-26.8	-5.3	16.8	-1.7	-4.6	14.1	10.8	35.0	35.0	280.7
Resolute, Nunavut	-32.4	-22.8	4.3	-14.9	-16.4	4.3	6.1	20.2	13.8	150.0
Baker Lake, Nunavut	-32.3	-17.4	11.4	-7.5	-11.8	7.5	13.6	41.8	32.1	270.4

Source(s): Environment Canada, 2006, Canadian Climate Normals or Averages 1971 to 2000, http://climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed November 23, 2007).

Climate profiles from west to east

Most of Canada is located within the north temperate zone,²⁵ and has four distinct seasons. Areas of the country with similar climates are grouped together into 11 distinct climate regions (Map 1.1 or 2.5).

As a result of the moderating effect of warm air off the Pacific Ocean, the Pacific Coast region enjoys the shortest and mildest winters, with average winter temperatures of 2.5°C. It also receives the most precipitation, with an average 1,695 mm of rain and snow. From 1948 to 2007, the annual temperature increased 1.2°C from the climate normal (Table 1.7).

British Columbia's mountainous interior supports glaciers on the mountain peaks and an interior dry belt. The northern boundary of the Great Basin Desert, Canada's only temperate desert, is located in the South British Columbia Mountains climate region. From 1948 to 2007, the annual temperature of this arid region increased 1.5°C from its climate normal.

Canada's interior has a wide range of temperatures, characteristic of a continental climate. Cold winter

25. Between the Tropic of Cancer (23°26' N) and the Arctic Circle (66° 33' N).

Table 1.7

Annual regional temperature departures from climate normal, trends and extremes, 1948 to 2007

	degrees Celsius	90% confidence interval ⁵	Trend ²				Extreme years		Annual 2007 ⁶	
			Coldest		Warmest		Year on record	Departure ³	Year on record	Departure ³
			Year on record	Departure ³	Year on record	Departure ³				
Canada ¹	1.4	0.7 to 1.7	1972	-1.8	1998	2.5	13	0.9		
Atlantic Canada	0.2	n.s.s. ⁶	1972	-1.4	1999	2.0	26	0.1		
Great Lakes and Lower St. Lawrence	0.6	n.s.s. ⁶	1978	-1.0	1998	2.3	14	0.7		
Northeastern Forest	0.8	n.s.s. ⁶	1972	-1.9	2006	2.3	14	0.6		
Northwestern Forest	1.8	0.9 to 2.4	1950	-2.1	1987	3.0	22	0.8		
Prairies	1.5	0.7 to 2.2	1950	-2.1	1987	3.1	17	1.0		
South British Columbia Mountains	1.5	1.1 to 2.1	1955	-1.8	1998	2.0	19	0.8		
Pacific Coast	1.2	0.8 to 1.7	1955	-1.2	1958	1.6	27	0.3		
North British Columbia Mountains and Yukon Territory	2.1	1.3 to 2.9	1972	-2.1	2005	2.8	31	0.9		
Mackenzie District	2.1	1.3 to 2.8	1982	-1.5	1998	3.9	18	1.0		
Arctic Tundra	1.6	0.7 to 2.1	1972	-2.4	2006	3.4	11	1.1		
Arctic Mountains and Fjords	1.1	0.2 to 1.7	1972	-1.9	2006	2.3	6	1.6		

1. The climate regions of Canada are illustrated in Map 1.1 or 2.5.

2. A linear (least square) trend over the period of record.

3. Difference from the normal temperature.

4. This column ranks 2007 temperature departures over the period between 1948 and 2007. For example, the Atlantic Canada Climate Region had a departure that was 0.1°C warmer than the long term temperature average, which ranked the 2007 season as the 26th warmest over the 60 year period.

5. 90% confidence interval obtained by a nonparametric technique.

6. Not statistically significant.

Source(s): Environment Canada, 2008, Meteorological Service of Canada, Climate Research Branch, Climate Trends and Variations Bulletin for Canada, Annual 2007, http://www.msc.ec.gc.ca/ccrm/bulletin/rsummarytable_e.html?table=temperature&season=Annual&date=2007&nyears=60 (accessed March 5, 2008).

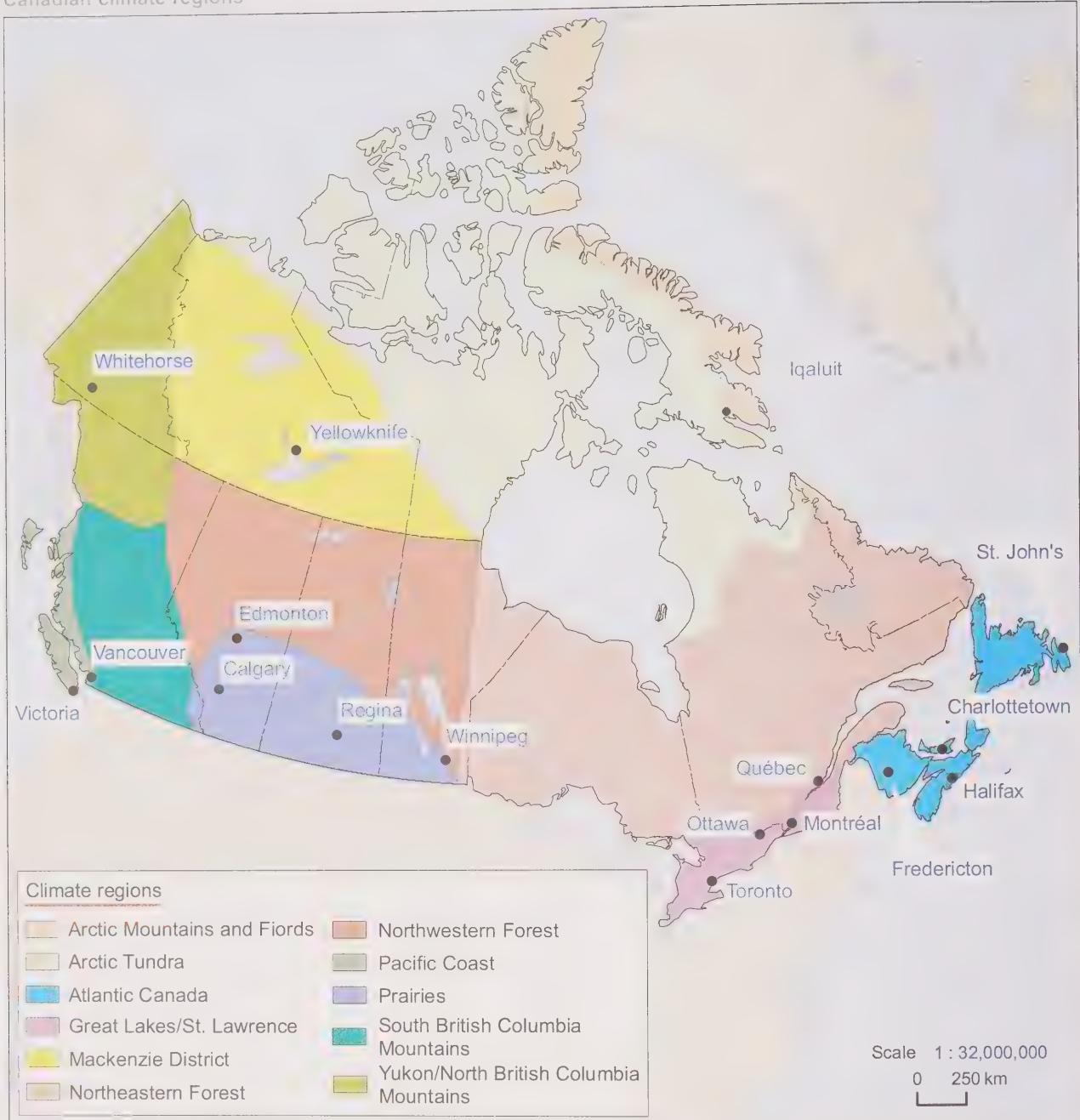
air from the north is channelled towards the Prairies and the Northwestern Forest region, which experience extremely cold winter temperatures and hot, dry summers. From 1948 to 2007, the temperature rose 1.5°C above normal in the Prairies.

The Great Lakes have a large influence on the climate in Canada's most populous climate region, the Great Lakes / St. Lawrence Lowlands. In summer, moist air from the lakes brings hot, humid weather. Temperatures, which average 18.4°C, are among the hottest in the country.

Atlantic Canada experiences mild winters and short, cool summers. The region also experiences the second-highest amount of precipitation, with over 1,200 mm of rain and snow each year.

Northern and Arctic areas experience the coldest and driest weather in the country. They have also seen some of the largest increases in temperatures over the past 60 years. From 1948 to 2007, temperatures increased 2.1°C in both the Yukon/North British Columbia Mountains region and the Mackenzie District. Temperatures also increased in the Arctic Tundra region (by 1.6°C) and Arctic Mountains and Fjords region (by 1.1°C).

Map 1.1
Canadian climate regions



Source(s): Environment Canada, Atmospheric Environment Service, Climate Research Branch, 1998, Climate Trends and Variations Bulletin for Canada, Ottawa.

Extreme events

While single storm events cannot be attributed to climate change, scientists predict that climate change will affect storm patterns and result in increased storm activity.²⁶ Extreme weather events such as storms, floods, hurricanes and tornadoes can have devastating consequences. In 2006 in British Columbia, record dryness in August led to water shortages for residents and tourists, while in November and December, wind and rain toppled thousands of trees in Stanley Park and led to power outages, flooding, landslides and Canada's largest-ever boil-water advisory, affecting people in the Lower Mainland for over 12 days.²⁷

1.3.2 Impacts on snow and ice

Warming temperatures and changes in precipitation will affect something that Canada has in abundance—snow. Less snowfall would reduce the need for snow clearing and road maintenance in some areas. Other areas would experience costs however, including reduced opportunities for skiing, snowmobiling and dogsledding. More rapid snowmelt would result in increased flooding.

Snow and ice cover in Canada is already changing and signs show that glaciers are receding and sea ice is decreasing in the Arctic.²⁸

Glaciers

Glaciers, masses of ice formed by compacted snow that move slowly down mountain sides, are found in Canada's western cordillera and the mountains of the eastern Arctic. Estimates based on available data indicate that just over 200,000 km², approximately 2% of the country's land mass, are covered by glaciers

(Tables 1.8 and 1.9).²⁹ However, the total inventory of Canada's glaciers is incomplete and the ice volume that they represent is poorly known.

Table 1.8

Estimated glacial area in Canada

	Area
	km ²
Arctic islands	151,057
Axel Heiberg Island	11,735
Baffin Island	37,000
Bylot Island	5,000
Devon Island	16,200
Ellesmere Island	80,000
Other islands	1,122
Drainage Areas	50,041
Nelson River	328
Yukon River	10,564
Great Slave Lake	626
Atlantic Ocean	24
Pacific Ocean (other than Yukon River drainage)	37,659
Arctic Ocean (other than Great Slave Lake drainage)	840
Total	201,098

Source(s): Satellite image atlas of glaciers of the world, U.S. Geological Survey professional paper 1386 J-1. *Glaciers of Canada, Introduction*, 2002, Edited by R.S. Williams Jr. and J.G. Ferrigno, 28 pp., <http://pubs.usgs.gov/prof/p1386j/canadaintro/canadaintro-hires.pdf> (accessed March 7, 2008).

Glaciers play an important role in the provision of fresh water. As snow accumulates and compacts, glaciers slowly proceed downslope under the force of gravity, eventually melting and contributing to streamflow at lower elevations. Glacial streamflow peaks in the hot summer months and provides moisture during the driest times of the year.

Some glaciers in the Rocky Mountains are receding and thinning, resulting in decreases in glacial streamflow during the critical driest months of the year. For example, the total glacial area in the North Saskatchewan River Basin decreased 22% from 1975 to 1998, while glacial cover decreased 36% in the South Saskatchewan River Basin (Table 1.9). Of the 853 glaciers documented in these basins in 1975, 328 have disappeared completely.

Decreases in glacier size are most evident for smaller glaciers.³⁰ Glacier contraction is likely accelerating as a result of higher air temperatures, less precipitation in winter and albedo feedback effects (Text box "Albedo feedback effects").

26. Solomon, S. et al., 2007, "Technical Summary," *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al. (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, <http://www.ipcc.ch/> (accessed January 11, 2007).
27. Environment Canada, Meteorological Service of Canada, 2006, Environment Canada's Top Weather Stories for 2006, http://www.msc.ec.gc.ca/media/top10/2006/index_e.html (accessed October 3, 2007).
28. Lemke, P. et al., 2007, "Observations: Changes in Snow, Ice and Frozen Ground," *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al. (eds.), Cambridge University Press, Cambridge, <http://www.ipcc.ch/> (accessed January 11, 2007).
29. Natural Resources Canada, 2004, "Glaciers and Icefields," *The Atlas of Canada*, <http://www.atlas.nrcan.gc.ca/site/english/maps/freshwater/distribution/glaciers/1> (accessed February 28, 2007).

30. Demuth, M.N., V. Pinard, A. Pietroniro, B.H. Luckman, C. Hopkinson, P. Dornes and L. Comeau, 2008. Recent and past-century variations in the glacier resources of the Canadian Rocky Mountains – Nelson River System. *Terra Glacialis* 11 (248): 27-52.

Albedo feedback effects

Albedo is the proportion of incoming solar radiation reflected from the earth back into space. It depends on many factors, including the colour and roughness of the terrain. Clouds, ice and snow reflect a greater proportion of radiation than do bare land and ocean surfaces, which tend to absorb this radiation.

Decreasing snow and ice cover leave greater areas of bare earth and ocean surface to absorb solar radiation, thereby contributing to continued and accelerated warming.

Socio-economic impact of reduced snowpack and melting glaciers

Much of western Canada, particularly the driest regions in the southern Prairies, is heavily dependent on snowmelt and glacier runoff for streamflow. Glacier-fed rivers reach peak streamflow during the hot summer

months, reducing variability in flow during periods of low precipitation. These rivers are an important source of water for community, agricultural and recreational activities.

With warmer conditions, less snow may accumulate in the mountains and spring runoff may occur earlier in the season. Glacial melt's contribution to streamflow is in decline in the eastern and southern cordillera regions.³¹ Reduced streamflow could result in water shortages during periods of peak summer demand. Water availability in these areas could be curtailed, with impacts on drinking water, recreation and industry.

Agriculture in southern Alberta and in parts of Saskatchewan and British Columbia relies heavily on irrigation. The three provinces used over 4.2 billion cubic metres of water to irrigate crops in 2001, 96% of all irrigation in Canada.³² Oilsands producers are also heavy users of water—currently 3 to 4 m³ of water is used to produce 1 m³ of oil.³³ Streamflow variability is a risk for the hydro power industry and lower water levels in rivers and lakes will challenge the health of freshwater fisheries.

Rising sea levels as a result of thermal expansion of sea water and the melting of glaciers, ice caps and ice sheets³⁴ are expected to contribute to flooding and erosion of coastal areas.³⁵

31. Demuth, M.N. and A. Pietroniro, 2003, The impact of climate change on the glaciers of the Canadian Rocky Mountain eastern slopes and implications for water resource adaptation in the Canadian Prairies, Climate Change Action Fund - Prairie Adaptation Research Collaborative, Final Report Project P55, plus Technical Appendices, 162 pages.
 32. Martin S. Beaulieu, Caroline Fric and François Soulard, 2007, "Estimation of Water Use in Canadian Agriculture," *Agriculture and Rural Working Paper Series*, Statistics Canada Catalogue no. 21-601-M, Ottawa.
 33. Industry Canada, 2007, *Canadian Technology in the Oil and Gas Industry*, <http://www.ic.gc.ca/epic/site/ogt-ipg.nsf/en/dk00095e.html> (accessed October 10, 2007).
 34. Solomon, S. et al., 2007, "Technical Summary," *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al. (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, <http://www.ipcc.ch/> (accessed January 11, 2007).
 35. Field, C.B. et al., 2007, "North America," *Climate Change 2007: Impacts Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry et al. (eds.), Cambridge University Press, Cambridge, <http://www.ipcc.ch/> (accessed January 11, 2007).

Table 1
Glacier area and volume: North Saskatchewan and South Saskatchewan River basins

	Total glacier area			Total glacier volume		
	1975	1998	Percentage change	1976	1998	Percentage change
	km ²	percent	km ³	percent		
North Saskatchewan ¹	393	306	-22	25.87	21.54	-17
South Saskatchewan	138	88.4	-36	5.21	3.24	-38

1. Not including Brazeau.

Source(s): Demuth, M.N., V. Pinard, A. Pietroniro, B.H. Luckman, C. Hopkinson, P. Dornes and L. Comeau, 2008. Recent and past-century variations in the glacier resources of the Canadian Rocky Mountains – Nelson River System. *Terra Glacialis* 11 (248): 27-52.

Sea ice

Sea ice controls the timing and amount of maritime activity in Canada's eastern and northern waters. Arctic waters are normally covered by solid pack ice throughout the winter, while summer break-up signals the opening of the shipping season.

Arctic sea ice has experienced enhanced summer break-ups over the last few decades, adding to evidence of warming near the North Pole. In September 2007, sea ice throughout the circumpolar region shrunk to its lowest level since satellite measurement began.³⁶

In the Canadian Arctic, the summer of 2007 was a year of very low sea ice coverage, but did not set record minimums. Ice conditions are highly variable on a year-to-year basis; however, satellite observations indicate that the extent of sea ice has declined since 1969 and submarine measurements indicate Arctic ice thickness diminished by 40% from 1961 to 2001.³⁷ (Text box "**Ayles Ice Shelf**")

Chart 1.11 shows the percentage of ice coverage in the eastern Canadian Arctic each year since 1968 on

September 10, the date when ice coverage is generally close to the year's minimum. Ice coverage on this date has been consistently below the 1971 to 2000 average since 1998.

Evidence shows that the length of the navigation season is increasing marginally in the Canadian Arctic while sea ice is decreasing.³⁸ The cost of shipping could be reduced if the Northwest Passage were ice-free for longer periods in the summer, allowing shorter routes between Europe and Asia. Longer shipping seasons could also improve access to remote communities and mines, to deliver supplies and retrieve goods and ore for export.

Ayles Ice Shelf

In August, 2005, the Ayles Ice Shelf, located on the north coast of Ellesmere Island in Nunavut, collapsed as a result of warm temperatures and persistent offshore winds.

The collapse created the Ayles Ice Island, the largest calving—or breaking away—from a Canadian ice shelf in 30 years. The ice in the Ayles Ice Island is suspected to be up to 4,500 years old. Over the course of two years, it drifted a total of 470 km before splitting in two in September 2007.

The movement of ice islands and icebergs is a potential danger to ship operations and drilling platforms in the Arctic Ocean.

Source(s): Environment Canada, 2007, *Ayles Ice Shelf*, <http://ice-glaces.ec.gc.ca/app/WsvPageDsp.cfm?id=11835&Lang=eng> (accessed October 4, 2007).

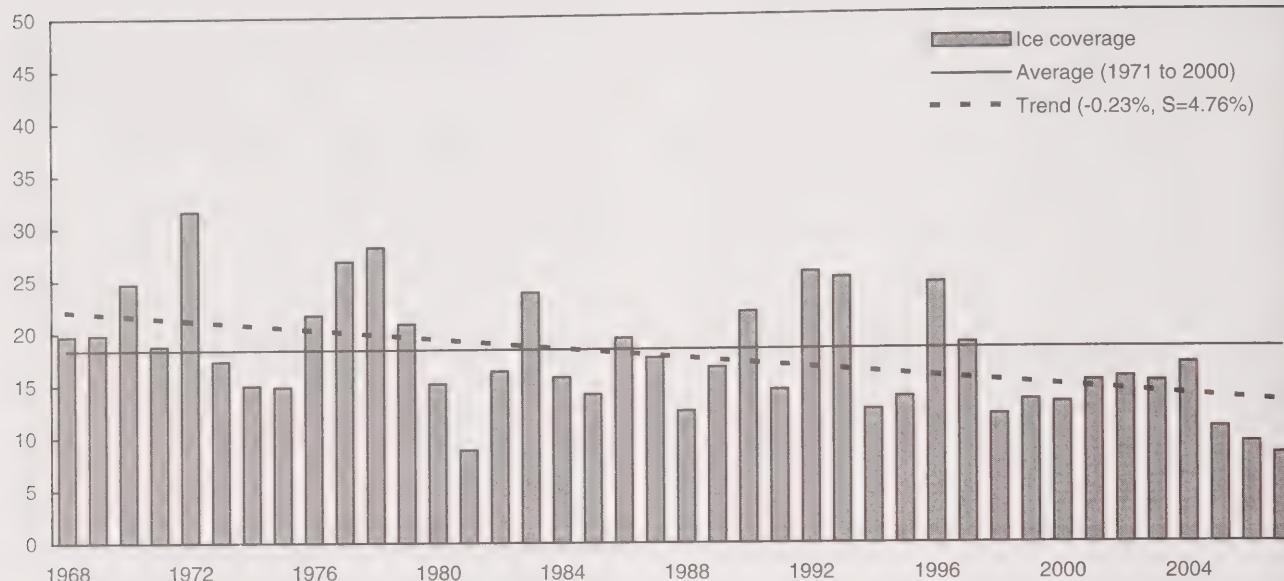
36. European Space Agency, 2007, *Satellites Witness Lowest Arctic Ice Coverage in History*, http://www.esa.int/esaCP/SEMYTC13J6F_index_2.html (accessed October 4, 2007).

37. Falkingham, J. C., R. Chagnon and S. McCourt, 2001, "Sea ice in the Canadian Arctic in the 21st century," Proceedings of the 16th International Conference on Port and Ocean Engineering Under Arctic Conditions, POAC 2001, Ottawa.

38. Ibid.

Chart 1.11
Ice coverage in the eastern Arctic region on September 10, 1968 to 2007

percent



Source(s): Environment Canada, Canadian Ice Service, <http://ice-glaces.ec.gc.ca/IceGraph/IceGraphdesGlaces.jsf?id=11874&lang=eng> (accessed March 5, 2008).

1.3.3 Other impacts affecting society and the economy

Climate change will have profound effects on Canada's natural resources and ecosystems. Biodiversity, the variability of life forms within a given ecosystem—including both marine and terrestrial systems—will also be affected.

These changes to Canada's climate will have beneficial and adverse effects on society and the economy. Although the costs and benefits are hard to quantify—lower costs to heat homes and buildings as a result of warmer winters may be offset by increases in air conditioning in the summer—changes are more likely to be negative if climate change is severe and occurs rapidly than if it is moderate and progresses gradually, allowing time for Canadians to adapt.

With warming temperatures, species and habitat will shift north, move to higher elevations and even disappear. Boundaries between forest and tundra ecosystems are expected to advance in altitude and latitude in response to climate warming.³⁹ Climatic limits for agricultural crops will also shift, though soils in more northern regions may be less suitable for agriculture.

A longer growing season and increasing levels of CO₂ could increase the productivity and yields of agricultural crops and timber forests. However, water shortages resulting from changes in the timing and amount of precipitation could limit yields, especially in the already drought-prone Prairies. Pest problems could also become more severe.

Range shifts in pests have already had a large impact on the forestry industry. In British Columbia, the spread of the mountain pine beetle (Text box "**Mountain pine beetles**") in the central interior of the province has coincided with warmer winter extremes.⁴⁰

39. Danby, Ryan K. and David S. Hik, 2007, "Variability, contingency and rapid change in recent subarctic alpine tree line dynamics," *Journal of Ecology*, Vol. 95, p. 352 to 363.

40. Carroll, Allan L. et al., 2004, "Effects of Climate Change on Range Expansion by the Mountain Pine Beetle in British Columbia," *Mountain Pine Beetle Symposium: Challenges and Solutions*, October 30-31, 2003, Kelowna, British Columbia. T.L. Shore et. al. (eds). Natural Resource Canada, Canadian Forest Service, Pacific Forestry Centre, Information Report BC-X-399, Victoria, BC. 298 p.

Mountain pine beetles

Mountain pine beetles prefer mature (80 years or older) lodgepole pine and kill trees by laying their eggs under tree bark. The developing larvae eat the tree's phloem, cutting off the supply of nutrients. The beetles also transmit a fungus that stains wood blue.

Cold winter temperatures of -35°C to -40°C over several days will kill a large proportion of the beetle population; however, the mild winters and dry summers of recent years have allowed beetles to thrive in British Columbia.

As temperatures rise, climate may no longer present a barrier limiting the range of mountain pine beetles to British Columbia. Beetles have recently moved into parts of western Alberta and concern is growing that they will spread across the Prairies and eastern Canada. Jack pine, a major component of the boreal forest, is a viable host tree for the beetles.

Source(s): British Columbia Ministry of Forests and Range, 2007, *Mountain Pine Beetle*, http://www.for.gov.bc.ca/hfp/mountain_pine_beetle#info (accessed October 10, 2007).



Mountain pine beetle damage, Otway, British Columbia, Dezene Huber, 2007

By 2007, the area affected by the infestation covered almost 13 million hectares. It is

estimated that the standing volume of dead wood was approximately 530 million m³ in 2007—approximately 40% of the merchantable pine volume and 12% of the province's total merchantable timber.⁴¹ This dead wood presents a fire hazard, especially for communities located in the infestation zone.

Altered temperature and precipitation patterns could affect water levels in wetlands, whose functions include flood protection, water filtration and wildlife habitat. Water levels in the Great Lakes and St. Lawrence River are expected to decline, and this would affect the quantity and quality of aquatic habitats, as well as shipping, recreational activities and drinking water facilities.

Commercial fisheries and aquaculture, important industries for many communities in the Atlantic provinces and the West Coast, would also be affected by changes in temperature, precipitation, wind and storms. In 2005, the landed value of commercial fisheries totalled \$2.1 billion,⁴² while production of aquaculture products, including fish and shellfish, totalled over \$700 million.⁴³

Environmental factors, such as freeze-thaw cycles and frost action, cause roads to deteriorate and crack. Warmer winter weather could significantly alter the cost of maintaining roads in southern parts of Canada by affecting freeze-thaw patterns which impact frost heave and frost damage to pavements. In 2006 governments spent more than \$8 billion building roads.⁴⁴

Melting permafrost in Canada's North will likely have severe impacts on infrastructure and transportation. Consequences of melting include soil subsidence, slope instability, and frost heave, with design implications for highways, buildings, bridges and pipelines.⁴⁵ Winter roads made of ice and snow are common in many areas of the north, for both community and industrial (for example, mining) activities. Changes in runoff and snowmelt might result in reductions in the operating period of these roads.

43. Statistics Canada, 2006, *Aquaculture Statistics*, Catalogue no. 23-222-X, (accessed October 28, 2007).

44. Statistics Canada, Investment and Capital Stock Division.

45. Williams, P.J. 1995, "Permafrost and climate change: geotechnical implications," *The Arctic and Environmental Change, Proceedings of a Royal Society Discussion meeting held October 4, 1994*, P. Wadhams, J.A. Dowdeswell and A.N. Schofield (eds.) Gordon and Breach Science Publishers SA, Amsterdam.

41. BC Ministry of Forests and Range, 2007, *Timber Supply and the Mountain Pine Beetle infestation in British Columbia, 2007 Update*, Forest Analysis and Inventory Branch, http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/Pine_Beetle_Update20070917.pdf (accessed October 10, 2007).

42. Fisheries and Oceans Canada, 2007, *Commercial Landings Summary Table*, Statistical Services, http://www.dfo-mpo.gc.ca/communic/statistics/commercial/landings/sum0407_e.htm (accessed July 11, 2007).

Warmer summer temperatures can also enhance the formation of ground-level ozone and lead to increases in emissions of air pollutants—through the greater use of air-conditioning systems, for example.⁴⁶ These air

pollutants affect human health, especially for those with allergies, asthma and respiratory disorders. Nationally, exposure to ground-level ozone increased an average of 0.8% per year from 1990 to 2005.⁴⁷

46. Patz, Jonathan A. et al., 2000, "The Potential Health Impacts of Climate Variability and Change for the United States : Executive Summary of the Report of the Health Sector of the U.S. National Assessment," *Environmental Health Perspectives*, Vol. 108, no. 4, pp. 367-376.

47. Environment Canada, Statistics Canada and Health Canada, 2007, *Canadian Environmental Sustainability Indicators*, Statistics Canada Catalogue no. 16-251-X, Ottawa.



Wind turbines, Alberta, TransAlta

1.4 How are we adapting? How are we responding to the challenge?

There has been a significant societal response to the problem of climate change. It is a daily topic in the media; consumer investment in hybrid vehicles, alternative power sources and green building materials is growing; and even our language is changing. The terms "carbon footprint," "green audit," "carbon neutral" and "emissions trading" have all been added to the latest **Shorter Oxford English Dictionary**.

Society's response to climate change includes two fundamental strategies—adaptation, where Canadians respond to a changing environment, and mitigation, where efforts are made to reduce greenhouse gas (GHG) emissions. This section outlines some of the projects and activities occurring on a national, industrial and individual basis that can help us adapt to, and mitigate, climate change.

1.4.1 Adaptation

Given the climate system of the earth, temperatures will continue to rise even if we manage to stabilize GHG emissions at an acceptable level. Therefore, independent of our efforts to decrease the rate and magnitude of climate change, we need to reduce our vulnerability to the impacts and position ourselves to capitalize on the opportunities it may present. As

mentioned in **Section 1.3, Climate change impacts**, climate change will have serious impacts on many ecosystems and human activities. Agriculture will suffer if there are more frequent droughts, some communities will be impacted by sea-level increases, and more frequent storms will tax our emergency response systems. Adaptation strategies can be put in place to help minimize these adverse effects.

Adaptation can take place both before and after the impacts of climate change are observed, and there are many different types of adaptation strategies (Table 1.10).

The Canadian Climate Impacts and Adaptation Research Network (C-CIARN) brings together players in the climate change issue—researchers, decision makers from industry and governments, and non-governmental organizations—to facilitate the generation and discussion of new ideas about climate change.⁴⁸ The Canadian government is taking steps to improve our ability to adapt to the effects of climate change. Expenditures under the Climate Change Impacts and Adaptation Program⁴⁹ have increased significantly in recent years (Chart 1.12). This fund supports research and activities to improve knowledge of Canada's vulnerability to climate change. In December 2007 the federal government announced a new initiative on climate change adaptation. The four-year program includes developing new tools to aid the development of adaptation strategies, and to

48. C-CIARN, no date, *Canadian Climate Change Impacts and Adaptation Research Network*, http://adaptation.nrcan.gc.ca/index_e.php (accessed March 22, 2007).

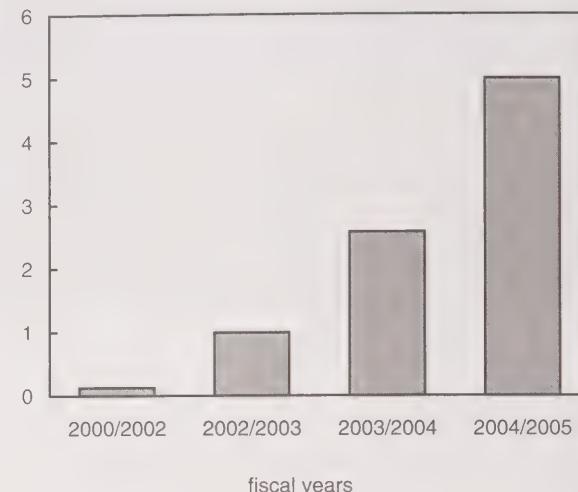
49. Natural Resources Canada, 2007, *Climate Change Impacts and Adaptation Program*, http://adaptation.nrcan.gc.ca/index_e.php (accessed March 22, 2007).

facilitate collaboration amongst players in government, economic sectors and local organizations. Specific funds will be targeted towards the development and implementation of regional adaptation programs.⁵⁰

50. Environment Canada, 2007, "News Release: Canada Leading by Example Baird Announces New Funding for Adaptation on Climate Change", <http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=CFF8C320-DF60-4658-9592-4D41497BE838> (accessed February 13, 2008).

Chart 1.12
Climate Change Impacts and Adaptation Program expenditures on research and assessment

millions of dollars



Source(s): Natural Resources Canada, 2006, "Climate Change Impacts & Adaptation Program (CCIP) Evaluation (E05023)", <http://www.nrcan.gc.ca/dmo/aeb/aeb-rpts-2006-E05023-e.htm> (accessed March 5, 2008).

Table 1.10
Adaptation strategies

	Explanation	Example
Bear costs	Do nothing to reduce vulnerability and absorb losses.	Allow household lawns and gardens to wither.
Prevent loss	Steps are taken to reduce vulnerability.	Protect coastal communities with seawalls.
Spread or share loss	The burden of loss is spread across different systems or populations.	Crop insurance.
Change activity	Stop activities that are no longer viable under the new climate, and substitute with activities that are more appropriate.	Convert a ski resort into a four-season facility to attract tourists year round.
Change location	Move the activity.	Move ice fishing operations farther north.
Enhance adaptive capacity	Improve the ability of a system to deal with stress by enhancing its resiliency.	Reduce non-climatic stresses, such as pollution.

Source(s): Natural Resources Canada, 2004, Climate Change Impacts and Adaptation: A Canadian Perspective, http://adaptation.nrcan.gc.ca/perspective/index_e.php (accessed March 22, 2007).

1.4.2 Mitigation: Domestic activities

With a number of celebrities and industries publicizing their efforts to compensate for their GHG-emitting activities, the concept of carbon offsetting has received a lot of public attention in recent months. As of November 2007, 60 communities in British Columbia

had pledged to become 'carbon neutral' by the year 2012. Communities plan to calculate their GHG emissions and then reduce them through buying hybrid vehicles, using alternative energy. To compensate for emissions released they will plant trees and buy carbon offsets.⁵¹ The jury is still out on the effectiveness of these carbon offset programs, but they have definitely brought the climate change problem to a broader audience and fuelled the mitigation discussion.

51. Birmingham, John, 2007, "60 B.C. Communities Pledge to be Carbon Neutral by Year 2012", Article in the daily newspaper, *The Province*, page A12, September 27, 2007.

There are many GHG-reducing programs at both the federal and provincial levels in Canada. Among other things, domestic programs encourage energy efficiency in homes and transportation, as well as partnerships among levels of government.

Energy efficiency in homes and transportation

Two key steps in the process of reducing GHG emissions are educating the public about the implications of climate change and encouraging energy efficiency and conservation.

The federal ecoEnergy initiatives are a series of programs aimed at helping Canadians use energy more efficiently through building retrofits and construction of more energy-efficient buildings. The initiatives also encourage the development of renewable energy and clean energy technologies.⁵²

The provinces are also encouraging energy efficiency. Hydro-Québec has launched an Energy Wise program as part of its mandate from the province to find 4.1 terawatt hours of energy savings.⁵³ It is offering rebates for residential energy-saving equipment, and an online diagnostic tool makes energy-saving recommendations that can be implemented at home.⁵⁴

Transportation is a significant source of GHG emissions. In 2004, light automobiles emitted 50.6 Mt of GHGs.⁵⁵ Increasing the number of commuters who use public transit can go a long way in reducing GHG emissions. Urban transit use increased slightly in Canada, from 1,270.6 million trips in 2003 to 1,364.1 in 2006.⁵⁶

Where we choose to live has an impact on our transportation choices. People living in low-density (suburban) neighbourhoods, often located far from the city centre, have a higher level of automobile dependence than those living in high-density (urban) neighbourhoods. In a snapshot of a single day in 2005,

over 80% of residents of areas comprised exclusively or almost exclusively of suburban-type housing made at least one trip by car (as the driver). In contrast, less than half of those living in very high-density areas did so.⁵⁷

The goal of the federal ecoTransport⁵⁸ initiative is to help municipalities reduce transportation emissions by increasing public transit ridership. The program will also educate the public about emerging energy-efficient technologies and help reduce the environmental and health effects of freight transportation through the use of technology. This program also encourages Canadians to buy fuel efficient vehicles by offering rebates.

Nova Scotia has introduced the TRAX project to promote environmentally friendly transportation options.⁵⁹ The goal of the project is to encourage active forms of transportation, such as walking or biking, and the use of public transportation and carpooling.⁶⁰

Other responses

In April 2007, the government of Canada released a plan to regulate both greenhouse gases and air pollution from industrial emitters.⁶¹ This plan is entitled the Turning the Corner Action Plan to Reduce Greenhouse Gases and Air Pollution, and has the objective to cut GHGs by 20% by 2020 and by 60% to 70% by 2050.

The Canada ecoTrust for Clean Air and Climate Change is a national fund intended to help provinces and territories develop technologies and projects to reduce air pollution and GHG emissions.⁶² Currently, the government of Canada has ecoTrust partnerships with all provinces and territories.

52. Government of Canada, 2008, ecoACTION: Using Less, Living Better, ecoENERGY, <http://ecoaction.gc.ca/ecoenergy-ecoenergie/index-eng.cfm> (accessed April 11, 2007).

53. Government of Quebec, 2005, Quebec in Action to Fight Climate Change, <http://www.mddep.gouv.qc.ca/chang-clim/clim-change.pdf> (accessed March 8, 2007).

54. Hydro-Québec, no date, "Programs and Tools to be Energy Wise," Energy Efficiency, <http://www.hydroquebec.com/energywise/index.html> (accessed March 13, 2007).

55. Statistics Canada, Environment Accounts and Statistics Division, *Human Activity and the Environment: Annual Statistics 2006*, catalogue no. 16-201-X.

56. Based on a survey of 10 major Canadian urban transit operators. The companies included in this survey account for about 80% of total urban transit traffic in Canada. Statistics Canada, CANSIM table 408-0004.

57. Martin Turcotte, 2008, "Dependence on cars in urban neighbourhoods," *Canadian Social Trends*, Statistics Canada Catalogue no. 11-008-X, Ottawa.

58. Transport Canada, 2007, "About ecoTransport," ecoTransport, <http://www.tc.gc.ca/programs/environment/ecotransport/menu-eng.htm> (accessed February 13, 2008).

59. Nova Scotia Department of Energy, 2005,

30. NS Energy Department 2007, "Public Transit," *Consumer Information*, <http://www.gov.ns.ca/energy/AbsPage.aspx?id=1370&siteid=1&lang=1> (accessed March 8, 2007).

60. Ecology Action Centre, no date, "TRAX," *Projects*

61. ecoACTION, 2007, "Turning the Corner: An action plan to reduce greenhouse gases and air pollution," <http://www.ecologyaction.ca/trax/index.html> (accessed March 14, 2007).

62. Office of the Prime Minister, 2007, *Prime Minister Unveils New Canada* <http://pm.gc.ca/eng/media/min/2007/02/15/22> (accessed February 13, 2008).

ecoTrust, <http://www.pm.gc.ca/eng/media.asp?id=1532> (accessed March 2, 2007).

The federal, and some provincial governments, are trying to set an example by reducing the GHGs emitted during their day-to-day activities. Programs to improve the energy efficiency of government buildings and reduce GHG emissions from government vehicles are the most common.

Table 1.11

Adoption and impact of new or significantly improved systems or equipment to reduce greenhouse gas emissions by industry, 2004¹

	Introduced new or significantly improved systems or equipment		Impact on emissions ²		
	Yes	No	Low	Moderate	High
			percent		
Logging	15	85	64	18	18
Oil and gas extraction	63	37	39	41	20
Mining	24	76	69	31	0
Electric power generation, transmission and distribution	27	73	44	33	22
Natural gas distribution	53	47	25	50	25
Food	24	76	53	35	18
Beverage and tobacco products	33	67	57	29	14
Wood products	19	81	45	36	18
Pulp, paper and paperboard mills	38	63	34	49	17
Petroleum and coal products	43	57	83	17	0
Chemicals	19	81	52	31	17
Non-metallic mineral products	18	82	53	40	7
Primary metals	26	74	41	43	15
Fabricated metal products	16	84	47	35	18
Transportation equipment	31	69	68	20	12
Pipeline transportation	35	65	58	42	0
Total	26	74	49	36	14

1. Adoption of new or significantly improved systems or equipment within a three-year period, 2002 to 2004.

2. Respondents who answered Yes to the adoption of new or significantly improved systems or equipment were asked to rank the impact on greenhouse gas reductions as being low, moderate or high.

Note(s): This table includes reported data only. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2007, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, 2004, Catalogue no. 16F0006X.

Expenditures to reduce greenhouse gas emissions

From 2002 to 2004, 26% of Canadian industries adopted new systems or equipment to reduce GHG emissions (Table 1.11). Of these industries, 50% indicated that the improvements had a moderate or large impact on GHG emissions.

In 2004, the business sector spent \$955 million on environmental processes and technologies to reduce GHGs (Table 1.12). The oil and gas industry, the wood products industry and the pulp, paper and paperboard mills industry each spent over \$140 million

to reduce their GHG emissions. Furthermore, in October 2007 the Forest Product Association of Canada announced a commitment by Canada's forest products industry to carbon neutrality by 2015—without the purchase of carbon offset credits. A partnership with WWF-Canada will inform and help guide the initiative.⁶³

63. Forest Products Association of Canada, October 2007 Press Release, Canadian Forest Products Industry Aims to Be First Carbon-Neutral Sector, http://www.fpac.ca/en/media_centre/press_releases/2007/2007-10-30_carbonNeutral.php#Background (accessed April 1, 2008).

Table 1.12

Total operating and capital expenditures on environmental products and technologies in emissions of greenhouse gases by industry, 2004

	Operating expenditures ¹	Capital expenditures ¹	Total
millions of dollars			
Logging	52.0	8.5	60.5
Oil and gas extraction	23.0	124.8	147.8
Mining	38.0	10.1	48.1
Electric power generation, transmission and distribution	75.7	21.2	96.9
Natural gas distribution	3.5	5.2	8.7
Food	8.8	23.7	32.5
Beverage and tobacco products	1.7	3.7	5.4
Wood products	106.5	45.9	152.3
Pulp, paper and paperboard mills	129.8	37.2	167.1
Petroleum and coal products	1.2	37.1	38.3
Chemicals	57.9	25.7	83.6
Non-metallic mineral products	11.0	8.1	19.1
Primary metals	34.9	5.4	40.3
Fabricated metal products	22.4	8.7	31.1
Transportation equipment	6.5	10.8	17.3
Pipeline transportation	3.1	3.1	6.2
Total	575.8	379.3	955.1

1. Capital expenditures refer to all costs in 2004 (reporting year) for machinery and equipment and their installation and repair, as well as for the construction of non-residential facilities (by contractors or own employees). Operating expenditures refer to all cash expenses, rather than accruals, incurred during the 2004 reporting year for maintenance and repair (of existing environmental equipment), labour, fuel and electricity, materials and supplies, and purchased services.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2007, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, 2004, Catalogue no. 16F0006X.

Research and development

According to a study by the National Advisory Panel on Sustainable Energy Science and Technology in Canada, Canadian industry spends, on average, 3.8% of corporate revenues on research and development. However, the energy industry spends 0.75%, and the oil and gas sector 0.36%—less than one-tenth the Canadian average.⁶⁴

Revenues from greenhouse gas-related products

Some industries have seen climate change as an opportunity to begin marketing GHG emissions-reducing technologies. These technologies range from alternative energy systems to co-generation and methane capture. Revenue from sales of these technologies has increased from 2002 to 2004 (Chart 1.13).

64. Natural Resources Canada, 2006, Powerful Connections, Priorities and Directions in Energy Science and Technology in Canada, 2006. The Report of the National Advisory Panel on Sustainable Energy Science and Catalogue no. M4-0/2006E ISBN: 0-662-43412-9, http://www.nrcan.gc.ca/eps/oerd-brde/report-rapport/toc_e.htm (accessed April 4, 2008).

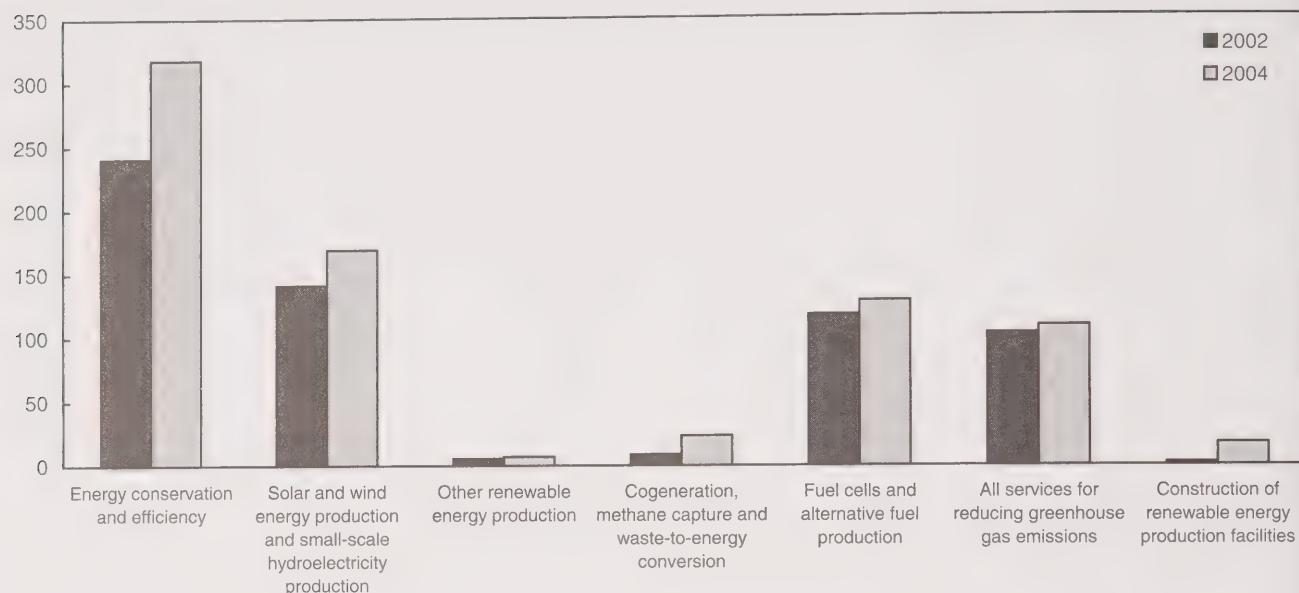
1.4.4 Mitigation: Renewable energy

One way that Canada can reduce its GHG emissions is by substituting renewable energy for non-renewable fossil fuels. Renewable energy sources produce electricity or thermal energy without depleting resources. Approximately 59% of Canada's electricity is produced using renewable energy⁶⁵ but almost all of this is hydroelectric (Table 1.13). The other sources of renewable energy—including, wind, tidal, solar, earth and geothermal, and bioenergy—currently contribute minimally to the overall supply (0.3% in 2005). This area has expanded more than 500% in the last five years, and will need to expand much more in coming years if we are to significantly decrease our dependence on fossil fuels for electricity.

65. Statistics Canada, 2007, Manufacturing, Construction and Energy Division Electric Power Generation, Transmission and Distribution, 2005, Catalogue no. 57-202-X.

Chart 1.13
Revenues from sales of greenhouse gas reducing environmental goods and services

millions of dollars



Source(s): Statistics Canada, 2007, Environment Accounts and Statistics Division, Environment Industry: Business sector 2002 (revised) and 2004, Catalogue no. 16F0008X.

Generation of renewable electric energy in Canada

	Hydro		Wind and tidal		Total energy from renewable and non-renewable sources
	megawatt hours	percent of total	megawatt hours	percent of total	
2000	354,548,761	60.52	263,820	0.05	585,813,884
2001	329,479,379	57.91	365,559	0.06	568,912,241
2002	346,462,100	59.63	434,798	0.07	581,062,857
2003	333,399,814	58.63	704,071	0.12	568,604,674
2004	336,659,556	58.30	971,873	0.17	577,466,928
2005	358,446,082	59.30	1,709,361	0.28	604,499,903

Note(s): These figures include electricity generated by both utilities and industry.

Source(s): Statistics Canada, 2007, Manufacturing, Construction and Energy Division, Electric Power Generation, Transmission and Distribution, multiple issues, Catalogue no. 57-202-X.

Different levels of government are encouraging investment in renewable energy. As one example of

66 Ontario Ministry of Energy, 2007, "What is the government doing to support 'green power'?" *Renewable Energy FAQs*, <http://www.energy.gov.on.ca/index.cfm?fuseaction=renewable.faqs> (accessed March 8, 2007).

a provincial initiative, Ontario now allows electricity customers who generate their own electricity from renewable sources to sell any excess electricity to the Ontario grid.⁶⁶ Funding from the federal ecoENERGY Renewable Initiative will be used to increase Canada's supply of electricity from renewable sources.

Hydroelectric energy

Canada is the world's leading producer of hydroelectricity. It draws on one of Canada's most abundant resources—water. However, this resource is not equally dispersed among the provinces: in 2004, Quebec generated almost half of the hydroelectricity in the country (Table 1.14).

Table 1.14

Hydroelectricity generated, by province and territory, 2004

	Electricity generated	
	megawatt hour	percentage of total
Canada total	336,659,556	100.00
Newfoundland and Labrador	39,589,147	11.76
Prince Edward Island	0	0.00
Nova Scotia	897,189	0.27
New Brunswick	3,013,367	0.90
Quebec	166,572,168	49.48
Ontario	39,498,038	11.73
Manitoba	27,219,340	8.09
Saskatchewan	2,746,393	0.82
Alberta	1,876,384	0.56
British Columbia	54,652,337	16.23
Yukon Territory	305,994	0.09
Northwest Territories	289,199	0.09
Nunavut	0	0.00

Source(s): Statistics Canada, 2006, Manufacturing, Construction and Energy Division, Electric Power Generation, Transmission and Distribution, 2004, Catalogue no. 57-202-X.

Hydroelectric power stations can convert more than 90% of the energy in water into electricity, making hydro one of the most efficient energy conversion technologies. However, some hydro stations produce methane (CH_4), a powerful GHG, because of the anaerobic respiration taking place in the flooded areas behind dams.⁶⁷

67. Natural Resources Canada, 2006, "About Hydroelectric Energy," *Technologies and Applications*, http://www.canren.gc.ca/tech_app/index.asp?Cald=4&PgId=26 (accessed April 11, 2007).

68. Natural Resources Canada, 2005, "About Wind Energy," *Technologies and Applications*, http://www.canren.gc.ca/tech_app/index.asp?Cald=6&PgId=232 (accessed April 11, 2007).

69. Government of Manitoba, no date, "Wind Energy," *Acting on Energy and Climate Change*, <http://www.gov.mb.ca/greenandgrowing/acting.html> (accessed March 27, 2007).

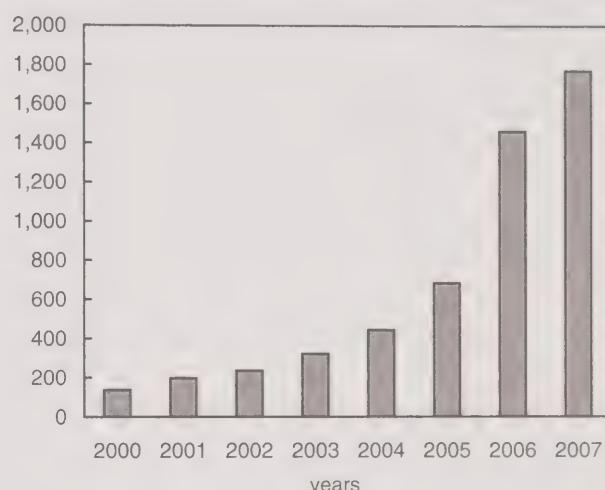
Wind energy

Like hydroelectric energy, wind energy generation also takes advantage of a natural phenomenon—the wind. In 2007, Canada's installed wind capacity was 1,770 MW (Chart 1.14). As wind energy production does not result in GHG emissions, 1 MWh of electricity generated by wind energy is equivalent to a reduction of 0.8 t to 0.9 t in GHG emissions from coal or diesel electricity production.⁶⁸

Chart 1.14

Canada's installed wind capacity

megawatt



Source(s): Canadian Wind Energy Association, "Canada's Current Installed Capacity," http://www.canwea.ca/production_stats.cfm (accessed March 5, 2008).

One of the largest wind farms in Canada is currently being built in Manitoba. When it is finished, it will supply 99 MW of electricity into the provincial grid. Manitoba's ultimate goal is to develop 1,000 MW of wind power over the next decade. This would result in annual GHG reductions of more than 3.5 Mt.⁶⁹ The current installed wind capacity of all provinces and territories is shown in Table 1.15.

Table 1.16
Measuring installed wind capacity, by province and territory, 2008

	Installed capacity kilowatts
Newfoundland and Labrador	390
Prince Edward Island	72,360
Nova Scotia	59,260
New Brunswick	0
Quebec	422,250
Ontario	501
Manitoba	103,950
Saskatchewan	171,180
Alberta	523,970
British Columbia	0
Yukon Territory	810
Northwest Territories	0
Nunavut	0

Source(s): Canadian Wind Energy Association, "Canada's Current Installed Capacity", http://www.canwea.ca/production_stats.cfm (accessed March 5, 2008).

Tidal energy

Tidal power harnesses the kinetic energy of moving water to generate electricity. This is done in two ways—with tidal dams or with ocean currents. Tidal dams trap water during high tides and release it through hydroelectric turbines as the tide recedes. Turbines are also usually placed in narrow and shallow constrictions where the water flows the fastest. In the Bay of Fundy, Nova Scotia Power is currently operating one of the only three tidal power plants in the world. The plant can produce up to 20 MW of power a day.⁷⁰

While tidal dams produce renewable energy, this type of energy generation raises some environmental concerns because the most suitable locations for tidal dams tend to be among very sensitive ecosystems, which can be disrupted by the functioning of the dam.⁷¹

70. Nova Scotia Power, 2005, Ebb and Flow, http://www.nspower.ca/environment/green_power/tidal/index.shtml (accessed April 13, 2007).

71. Statistics Canada, 2004, Environment Accounts and Statistics Division, Human Activity and the Environment, "Energy in Canada," catalogue no. 16-201X.

72. Statistics Canada, 2007, Environment Accounts and Statistics Division, Survey of Environmental Protection Expenditures. These data exclude the 'other manufacturing' industry.

73. Natural Resources Canada, 2006, "About Earth and Geothermal Energy," Technologies and Applications, http://www.canren.gc.ca/tech_appl/index.asp?Cald=3&PgId=8 (accessed March 15, 2007).

74. Natural Resources Canada, 2002, "About Bioenergy," Technologies and Applications, http://www.canren.gc.ca/tech_appl/index.asp?Cald=2&PgId=62 (accessed March 15, 2007).

Solar energy

Solar power generation uses the free and unlimited supply of energy from the sun. In 2004, 7% of Canadian industries were using solar energy systems or equipment.⁷² Solar power is also convenient for remote communities because a home does not need to be connected to the grid to take advantage of solar energy.

Earth and geothermal energy

Earth and geothermal energy are two types of energy that can be obtained from the earth. Earth energy can be used to cool or heat air and water for buildings. A heat pump can extract heat from the ground to heat a building in winter, or pump warm air into the ground to cool a building in summer. This kind of energy is efficient because it requires less energy to move heat from one place to another than to convert one form of energy into another.⁷³

Geothermal energy uses the steam or hot water found in the earth's crust. This hot water can be used directly to heat buildings, or to power turbines and generate electricity.

Bioenergy

Bioenergy is created by the combustion of biomass, i.e. any organic material. Sources of biomass for bioenergy production include agricultural waste, forest waste, municipal waste and food processing waste. As a result of the short replication cycle of biomass, using bioenergy does not increase atmospheric carbon dioxide, and can actually decrease emissions of methane (another more potent greenhouse gas)—which is given off by decaying plant matter.⁷⁴

The government of Canada has regulated the use of biofuels. As of 2010, gasoline must have 5% biofuel content.⁷⁵ The federal ecoENERGY for Biofuels program supports the production of cleaner, renewable alternatives to gasoline and diesel and encourages the development of a domestic industry for renewable fuels.⁷⁶

75. Agriculture and Agri-Food Canada, 2006, "Canada's New Government Takes New Step to Protect the Environment with Biofuels," http://www.agr.gc.ca/cb/index_e.php?s1=n&s2=2006&page=n61220 (accessed March 2, 2007).

76. Natural Resources Canada, 2007, "ecoENERGY for Biofuels Overview," <http://oeee.nrcan.gc.ca/transportation/ecoenergy-biofuels/index.cfm?attr=1> (accessed February 13, 2008).

1.4.5 Innovations

A wide range of technologies can help reduce energy consumption and GHG emissions. Some of these technologies are applicable only to large-scale industrial processes, but others are equally suited to industrial and residential purposes.

Low-emission alternatives

A variety of products available for personal consumption provide a low-GHG alternative to things we use every day. Among these are hybrid electric vehicles, on-demand hot water heaters and energy-saving light bulbs.

True to its name, a hybrid electric vehicle⁷⁷ combines two systems—a battery and an internal combustion engine. With the battery providing some of their power, hybrids burn less fuel to travel the same distance as regular cars, producing less GHG. The federal government and several of the provinces offer rebates on hybrid cars.⁷⁸

On-demand hot water systems⁷⁹ heat water only when it is needed. Less energy is used overall, as it is no longer necessary to keep a storage tank of hot water warm.

Doing something as simple as replacing a light bulb can help save energy. Incandescent light bulbs only use 10% of the energy that they consume to produce light; the other 90% is converted into heat.⁸⁰ Fluorescent lights can reduce lighting energy costs by up to 75%.⁸¹ From 1994 to 2006, the share of households in Canada having at least one compact fluorescent light bulb (CFL) went from 19% to 56%. Households in all provinces contributed to this increase. In 2006, British Columbia and Ontario had the highest percentage of households using CFLs (63% and 60% respectively).⁸²

Light-emitting diodes (LEDs), the small bulbs that have become a popular choice for Christmas light strings, use 95% less energy than their incandescent counterparts.⁸³

Programmable thermostats, which automatically adjust the temperature setting according to the time of day, also allow households to save energy and reduce emissions. These devices have become increasingly popular among Canadians. In 1994, 16% of households with a thermostat had a programmable thermostat. This percentage grew to 40% by 2006, with increases seen in every province.⁸⁴

Cogeneration: Waste not, want not

Simultaneously producing electrical and thermal energy from a single fuel is known as cogeneration. The heat produced during the electricity generation process is used to convert water into steam. The steam can then be used in industrial processes or piped to residential areas to heat homes. In 2004, 8% of Canadian industries⁸⁵ were using this technology.

Carbon dioxide capture and sequestration

Carbon dioxide (CO₂) capture and sequestration is an approach to mitigating climate change by preventing the release of CO₂ into the atmosphere. The technology involves capturing CO₂ released at large point sources, including fuel combustion or industrial processes, and storing it. There are several potential storage methods including, geological storage (in geological formations, such as oil and gas fields and deep saline formations), ocean storage (direct release into the water column or onto the deep seafloor) and industrial fixation of CO₂ (into inorganic carbonates).⁸⁶ Some of the necessary technical expertise for carbon capture and sequestration is already available.

- 77. Natural Resources Canada, 2006, *Battery-electric and Hybrid Vehicles*, <http://oeo.nrcan.gc.ca/transportation/fuels/electric/electric.cfm?attr=16> (accessed March 20, 2007).
- 78. Curry, Bill and Greg Keenan, 2007, "Federal Budget Can Add \$4000 to Price of SUVs; Fuel Efficient Cars Get Big Discounts," *The Globe and Mail*.
- 79. Natural Resources Canada, Instantaneous Water Heating, http://www.nrcan.gc.ca/es/etb/cetc01/htmldocs/Publications/factsheet_instantaneous_water_heating_e.htm (accessed March 20, 2007).
- 80. Natural Resources Canada, 2007, *Switch and Save*, <http://oeo.nrcan.gc.ca/energystar/english/consumers/questions-answers.cfm?attr=4#replace> (accessed March 22, 2007).
- 81. BC Hydro, 2007, *Energy-Efficient Lighting*, <http://www.bchydro.com/powersmart/elibrary/elibrary679.html> (accessed March 20, 2007).
- 82. Statistics Canada, 2007, Environment Accounts and Statistics Division, Households and the Environment, 2006, Catalogue no. 11-526-X.
- 83. BC Hydro, 2007, *Holiday LED Lights (Christmas Lights)*, <http://www.bchydro.com/powersmart/elibrary/elibrary8849.html> (accessed March 20, 2007).
- 84. Statistics Canada, 2007, Environment Accounts and Statistics Division, Households and the Environment, 2006, Catalogue no. 11-526-X.
- 85. Statistics Canada, 2007, Environment Accounts and Statistics Division, Survey of Environmental Protection Expenditures. These data exclude the 'other manufacturing' industry.
- 86. Intergovernmental Panel on Climate Change, 2005, Special Report on Carbon Dioxide Capture and Storage. Prepared by Working Group III of the Intergovernmental Panel on Climate Change (Metz, B.,O. Davidson, H. C. de Coninck, M. Loos, and L. A. Meyer (eds.)). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 442 pp. http://arch.rivm.nl/en/int/ipcc/pages_media/SRCCS-final/SRCCS_WholeReport.pdf (accessed Nov 11, 2007).

Canada is involved in various CO₂ capture and sequestration pilot projects, and EnCana Corporation in Weyburn Saskatchewan has been running one of the largest carbon storage facilities in the world for the past seven years. At this facility CO₂ is transported from an American coal gasification plant 161 km away in Beulah, North Dakota and injected 1.6 km underground, where it forces up oil from the existing oil reservoir. This extends the life of the oil field and serves the dual purpose of storing CO₂. The revenue received from the additional oil extracted pays for the cost of transportation and injection of the CO₂ into the ground.

The potential of CO₂ capture and storage is considerable, and the costs for mitigating climate change can be decreased compared to strategies where only other climate change mitigation options are considered. According to a 2005 IPCC report the importance of future capture and storage of CO₂ for mitigating climate change will depend on a number of factors, including financial incentives provided for

deployment, and whether the risks of storage can be successfully managed.⁸⁷

There are local and global concerns associated with the risk of leakage. If CO₂ leaks out of a storage formation there may be local impacts on humans, ecosystems and groundwater, and this risk increases if the injected CO₂ contains toxic impurities. The release of CO₂ may contribute significantly to global climate change if some portion leaks from the storage formation into the atmosphere. Continuous leakage could, at least in part, offset the climate benefits of sequestration.

Countries around the world are striving to reduce GHG emissions, but dependence on fossil fuels in the short term seems certain. How society responds to this challenge, and the role that carbon capture and storage will play, are important issues for Canadians to consider.

87. *Ibid.*

Section 2

Annual statistics: Canada's physical environment

2.1 Physiography

Physiography, or physical geography, is the study of the physical features of the earth's surface. This section covers two of the key elements that make up Canada's physiography: land cover and hydrology.

2.1.1 Land cover

Land cover represents the surface properties of the land. Land cover information is a basic requirement for the determination of land use and, ultimately, of land value. Canada's land area totals nearly 10 million km². The two most extensive land cover types in Canada are evergreen needleleaf forest (26%) and low vegetation/barren (29%), representing just over half of Canada's land cover.

Map 2.1 shows the distribution of 10 different land cover types across Canada. Land cover types and areas are presented by ecozone in Table 2.1.

2.1.2 Ecozones

The desire for a national approach to ecosystem classification and mapping in Canada led to the development of a hierarchical ecological classification framework. The objective of the approach was to delineate, classify and describe ecologically distinct areas of the earth's surface at different levels of

generalization. The ecological framework was developed by identifying distinct areas of non-living (abiotic) and living (biotic) factors that are ecologically related. From the broadest to the smallest, the hierarchical classification consists of seven levels of generalization: ecozones, ecoprovinces, ecoregions, ecodistricts, ecosections, ecosites and ecoelements. Map 2.2 illustrates the boundary delineations of the country's 15 terrestrial ecozones.

2.1.3 Hydrology

Hydrologists identify eleven major drainage areas and 164 sub-drainage areas in Canada. A sub-drainage area is composed of one or more river basins, also called watersheds. A watershed is an area where all surface waters, for example, runoff from precipitation and snowmelt and streamflow, share the same outlet. Map 2.3 and Table 2.2 outline Canada's major drainage areas and sub-drainage areas.

An estimated 12% of Canada, or 1.2 million km², is covered by lakes and rivers (Table 2.3). While many provinces have a substantial amount of water in comparison with their population, only 3% of the area covered by water in Canada is located in inhabited regions.¹ Canada's major river basins and their water resource characteristics are outlined in Map 2.4 and Table 2.3 respectively. Table 2.4 shows the distribution of streamflow, water area and population for each province and territory.

1. Fresh Water Resources, Human Activity and the Environment, Annual Statistics 2003, catalogue no. 16-201-X.

2.2 Climate

Climate can be defined as the average weather that occurs in a specific area over a period of time. Humans rely heavily on the regularity of climate patterns for almost all of their activities. Climate is measured using various weather elements as indicators. The two essential indicators, temperature and precipitation, are measured systematically at a site over time, accumulating an archive of observations from which climatic summaries can be derived for that location. Daily stations provide readings once or twice daily for temperature and precipitation while principal stations provide hourly readings of more detailed weather information for forecasting purposes.

Table 2.5 lists some of the more extreme weather events that affected areas of Canada in 2007.

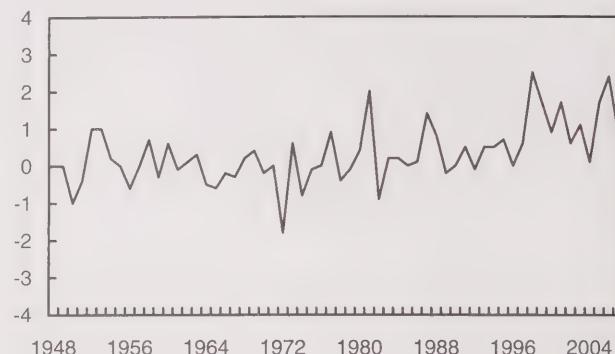
2.2.1 Temperature

Drastic changes in temperature signal the change from one season to the next in Canada. Although winters can be bitterly cold, summers can be hot and dry, or hot and humid, depending on the region. Table 2.6 summarizes the mean daily temperatures by month as recorded at selected weather stations across Canada and averaged over the period 1971 to 2000.

Chart 2.1 shows the trend in average air temperature in Canada over the last half-century. In recent years, Canada appears to be experiencing warmer average temperatures. Table 2.7 presents temperature trends and departures for the climate regions shown in Maps 1.1 in Section 1 and 2.5 in Section 2.

Chart 2.1
Annual national temperature departures

degrees Celsius



Note(s): Departures from 1951 to 1980 temperature average. An increasing trend of 1.4°C with a 90% confidence interval of 0.7°C to 1.7°C was detected.

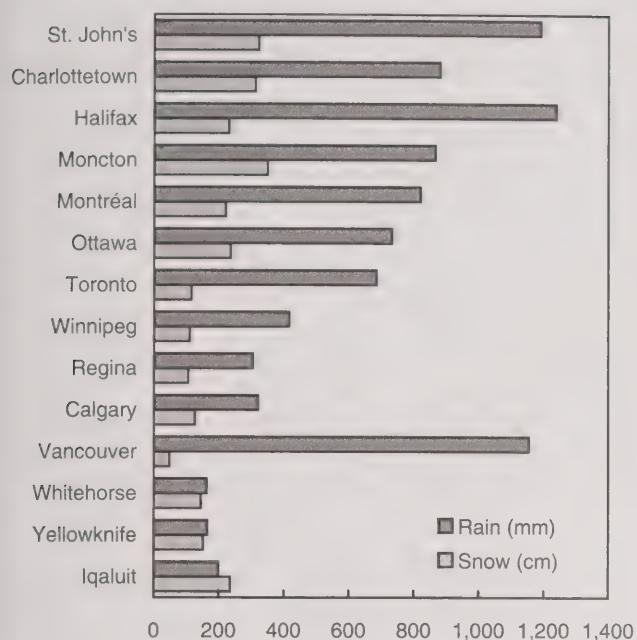
Source(s): Environment Canada, Meteorological Service of Canada, Climate Research Branch, 2008, Climate Trends and Variations Bulletin for Canada, Annual 2007, http://www.msc.ec.gc.ca/ccrm/bulletin/archive_e.cfm (accessed January 11, 2008).

2.2.2 Precipitation

Some 5,500 km³ of precipitation falls on Canada every year, mainly in the form of rain and snow.² Air masses that carry this precipitation generally circulate from west to east (Map 2.6). Chart 2.2 shows the average annual precipitation as recorded at selected weather stations.

2. Fresh Water Resources, Human Activity and the Environment, Annual Statistics 2003, catalogue no. 16-201-X.

Chart 2.2
Average annual precipitation, 1971 to 2000



Source(s): Environment Canada, 2004, Canadian Climate Normals, 1971-2000, www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed November 29, 2005).

Map 2.1
Land cover, 2005



1. The disturbance area category refers to forest disturbance, which can be caused by changes in forest structure or composition resulting from natural events such as fire, flood or wind, from mortality caused by insect or disease outbreaks, or from human-caused events such as forest harvesting.
2. 'Other' consists of water, snow/ice, urban and built-up land and statistical error.

Source(s): Latifovic, Rasim and Darren Pouliot, 2005, "Multi-temporal land cover mapping for Canada: Methodology and Products," Canadian Journal of Remote Sensing, Vol. 31, no. 5, p. 347-363. Natural Resources Canada, Canada Centre for Remote Sensing. Agriculture and Agri-Food Canada and Environment Canada, 2003, Framework Data - National Resolution - Ecological Units, http://sis.agr.gc.ca/cansis/nsdb/ecostrat/gis_data.html (accessed December 5, 2007). Statistics Canada, Environment Accounts and Statistics Division.

Map 2.2
Terrestrial ecozones



Source(s): Wiken, E.B. et al., 1996. A Perspective on Canada's Ecosystems: An Overview of the Terrestrial and Marine Ecozones. Canadian Council on Ecological Areas, Occasional Paper, No. 14, Ottawa.

Map 2.3
Major drainage areas and sub-drainage areas



Note(s): The sub-drainage area codes on this map are used in Table 2.2.

Source(s): Natural Resources Canada, 2003, National Scale Frameworks Hydrology –Drainage Areas, Canada, Version 5.0. www.geogratis.gc.ca (accessed September 16, 2003). Statistics Canada, Environment Accounts and Statistics Division, Spatial Environmental Information System.

Map 2.4
Major river basins



Major river basins

1. Pacific Coastal	9. Missouri	17. Northern Ontario
2. Fraser –Lower Mainland	10. North Saskatchewan	18. Northern Quebec
3. Okanagan –Similkameen	11. South Saskatchewan	19. Great Lakes –St. Lawrence
4. Columbia	12. Assiniboine –Red	20. North Shore –Gaspé
5. Yukon	13. Winnipeg	21. Saint John –St. Croix
6. Peace –Athabasca	14. Lower Saskatchewan –Nelson	22. Maritime Coastal
7. Lower Mackenzie	15. Churchill	23. Newfoundland –Labrador
8. Arctic coast –Islands	16. Keewatin –Southern Baffin Island	

Note(s): The river basin codes in this map are used in Tables 2.3, 3.5 and 3.55.

Source(s): Pearse, P.H., F. Bertrand and J.W. MacLaren, 1985. Currents of Change: Final Report of the Inquiry on Federal Water Policy. Environment Canada, Ottawa.
Statistics Canada, Environment Accounts and Statistics Division, Spatial Environmental Information System.

Map 2.5
Canadian climate regions

Source(s): Environment Canada, Atmospheric Environment Service, Climate Research Branch, 1998, Climate Trends and Variations Bulletin for Canada, Ottawa.

Map 2.6
Normal precipitation, 1971 to 2000



Note(s): The data for this map were estimated using a two-pass inverse distance-weighted interpolation of the 1971 to 2000 normal precipitation data from the Meteorological Service of Canada, using the Albers Equal Area Conic projection (Statistics Canada, Environment Accounts and Statistics Division).

Source(s): Environment Canada, Meteorological Service of Canada.
Statistics Canada, Environment Accounts and Statistics Division.

Table 2.1
Land cover by ecozone, 2005

	Evergreen needleleaf forest	Deciduous broadleaf forest	Mixed forest	Disturbance ¹	Shrubland	Grassland	Low vegetation and barren	Cropland	Cropland with Woodland	Other ²	Total
thousands of square kilometres											
Total	2,552	35	1,122	267	1,006	49	2,857	419	237	1,432	9,976
Arctic Cordillera	0 ^s	0	0	0 ^s	0	0	101	0	0	143	248
Northern Arctic	2	0	0	0 ^s	9	0	1,322	0	0	191	1,523
Southern Arctic	52	0	0 ^s	1	38	0	612	0	0	150	1,852
Taiga Plains	305	1	68	28	122	0	43	0 ^s	1	89	658
Taiga Shield	497	0	1	73	123	0	429	0	0 ^s	271	1,393
Boreal Shield	862	13	456	86	183	0 ^s	33	2	8	278	1,921
Atlantic Maritime	20	11	137	1	3	0 ^s	0 ^s	8	12	10	203
Mixed Wood Plains	0	1	25	0 ^s	4	0 ^s	0 ^s	17	56	65	168
Boreal Plains	181	5	220	24	84	1	2	92	62	72	744
Prairies	0	0 ^s	4	0 ^s	4	46	0 ^s	297	90	25	466
Taiga Cordillera	21	0	3	9	82	0	140	0	0	13	267
Boreal Cordillera	172	0 ^s	19	18	136	0	93	0	0	30	467
Pacific Maritime	18	3	70	3	48	0	15	1	1	47	205
Montane Cordillera	185	1	118	11	75	2	55	2	5	34	487
Hudson Plains	236	0	2	12	95	0	14	0	0 ^s	16	376

1. The disturbance area category refers to forest disturbance, which can be caused by changes in forest structure or composition resulting from natural events such as fire, flood or wind, from mortality caused by insect or disease outbreaks, or from human-caused events such as forest harvesting.

2. 'Other' consists of water, snow/ice, urban and built-up land and statistical error.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Latifovic, Rasim and Darren Pouliot, 2005, "Multi-temporal land cover mapping for Canada: Methodology and Products," Canadian Journal of Remote Sensing, Vol. 31, no. 5, p. 347-363. Natural Resources Canada, Canada Centre for Remote Sensing, Agriculture and Agri-Food Canada and Environment Canada, 2003, Framework Data - National Resolution - Ecological Units, http://sis.agr.gc.ca/cansis/nsdb/ecostrat/gis_data.html (accessed December 5, 2007). Statistics Canada, Environment Accounts and Statistics Division.

Table 2.2
Major drainage and sub-drainage area¹ names and areas

	Drainage area code	Area
	code	square kilometres
Maritime Provinces	1	
Saint John and Southern Bay of Fundy, New Brunswick	01A	41,987
Gulf of St. Lawrence and Northern Bay of Fundy, New Brunswick	01B	60,653
Prince Edward Island	01C	5,943
Bay of Fundy and Gulf of St. Lawrence, Nova Scotia	01D	21,499
Southeastern Atlantic Ocean, Nova Scotia	01E	23,222
Cape Breton Island	01F	10,685
Maritime Provinces total	...	163,990
St. Lawrence	2	
Northwestern Lake Superior	02A	51,541
Northeastern Lake Superior	02B	61,283
Northern Lake Huron	02C	45,421
Wanapitei and French, Ontario	02D	19,669
Eastern Georgian Bay	02E	28,778
Eastern Lake Huron	02F	33,728
Northern Lake Erie	02G	35,302
Lake Ontario and Niagara Peninsula	02H	39,336
Upper Ottawa	02J	50,670
Central Ottawa	02K	40,753
Lower Ottawa	02L	54,719
Upper St. Lawrence	02M	6,139
Saint-Maurice	02N	42,251
Central St. Lawrence	02O	35,600
Lower St. Lawrence	02P	37,780
Northern Gaspé Peninsula	02Q	13,383
Saguenay	02R	88,072
Betsiamites, coast	02S	27,473
Manicouagan and aux Outardes	02T	65,221
Moisie and St. Lawrence Estuary	02U	39,589
Gulf of St. Lawrence, Romaine	02V	36,416
Gulf of St. Lawrence, Natashquan	02W	53,841
Petit Mécatina and Strait of Belle Isle	02X	50,320
Northern Newfoundland	02Y	66,153
Southern Newfoundland	02Z	44,441
St. Lawrence total	...	1,067,879
Northern Quebec and Labrador	3	
Nottaway, coast	03A	67,938
Broadback and Rupert	03B	77,195
Eastmain	03C	45,930
La Grande, coast	03D	112,203
Grande rivière de la Baleine, coast	03E	62,753
Eastern Hudson Bay	03F	46,383
Northeastern Hudson Bay	03G	100,054
Western Ungava Bay	03H	78,208
Aux Feuilles, coast	03J	63,722
Koksoak	03K	45,542
Caniapiscau	03L	90,094
Eastern Ungava Bay	03M	106,790
Northern Labrador	03N	92,911
Churchill Newfoundland and Labrador	03O	95,003
Central Labrador	03P	35,678
Southern Labrador	03Q	37,889
Northern Quebec and Labrador total	...	1,158,292
Southwestern Hudson Bay	4	
Hayes, Manitoba	04A	109,482
Southwestern Hudson Bay	04B	28,384
Severn	04C	99,533
Winisk, coast	04D	79,224
Ekwan, coast	04E	50,484
Attawapiskat, coast	04F	57,243
Upper Albany	04G	64,914
Lower Albany, coast	04H	42,345
Kenogami	04J	52,370
Moose, Ontario	04K	17,949
Missinaibi and Mattagami	04L	60,593
Abitibi	04M	29,291
Haricanaw, coast	04N	43,509

See footnotes at the end of the table.

Table 2.2 – continued

Major drainage and sub-drainage area¹ names and areas

	Drainage area code	Area
	code	square kilometres
Southwestern Hudson Bay total	...	735,320
Nelson River	5	46,410
Upper South Saskatchewan	05A	25,628
Bow	05B	50,315
Red Deer	05C	27,983
Upper North Saskatchewan	05D	42,275
Central North Saskatchewan	05E	30,241
Battle	05F	49,652
Lower North Saskatchewan	05G	55,268
Lower South Saskatchewan	05H	74,589
Qu'Appelle	05J	81,194
Saskatchewan	05K	82,719
Lake Winnipegosis and Lake Manitoba	05L	51,259
Assiniboine	05M	39,591
Souris	05N	25,266
Red	05O	55,104
Winnipeg	05P	52,550
English	05Q	63,642
Eastern Lake Winnipeg	05R	41,819
Western Lake Winnipeg	05S	42,390
Grass and Burntwood	05T	49,119
Nelson	05U	987,015
Nelson River total	...	49,940
Western and Northern Hudson Bay	6	
Beaver, Alberta and Saskatchewan	06A	44,288
Upper Churchill, Manitoba	06B	45,892
Central Churchill, upper, Manitoba	06C	67,357
Reindeer	06D	51,295
Central Churchill, lower, Manitoba	06E	54,799
Lower Churchill, Manitoba	06F	75,970
Seal, coast	06G	73,301
Western Hudson Bay, Southern	06H	85,479
Thelon	06J	68,952
Dubawnt	06K	70,690
Kazan	06L	67,783
Chesterfield Inlet	06M	63,743
Western Hudson Bay, central	06N	54,523
Western Hudson Bay, northern	06O	48,784
Hudson Bay, Southampton Island	06P	13,285
Foxe Basin, Southampton Island	06Q	59,727
Foxe Basin, Melville Peninsula	06R	211,083
Foxe Basin, Baffin Island	06S	46,342
Hudson Strait, Baffin and Southampton Islands	06T	1,253,213
Western and Northern Hudson Bay total	...	
Great Slave Lake	7	34,856
Upper Athabasca	07A	40,496
Central Athabasca, upper	07B	57,030
Central Athabasca, lower	07C	29,942
Lower Athabasca	07D	72,362
Williston Lake	07E	67,824
Upper Peace	07F	51,508
Smoky	07G	35,412
Central Peace, upper	07H	59,401
Central Peace, lower	07J	36,510
Lower Peace	07K	70,913
Fond-du-Lac	07L	39,560
Lake Athabasca, shores	07M	19,009
Slave	07N	51,405
Hay	07O	38,067
Southern Great Slave Lake	07P	103,895
Great Slave Lake, east arm, south shore	07Q	27,124
Lockhart	07R	74,222
Northeastern Great Slave Lake	07S	24,262
Marian	07T	41,056
Western Great Slave Lake	07U	974,853
Great Slave Lake total	...	

See footnotes at the end of the table.

Table 2.2 – continued

Major drainage and sub-drainage area¹ names and areas

	Drainage area code	Area
	code	square kilometres
Pacific		
Alsek	8	
Northern coastal waters, British Columbia	08A	31,192
Stikine, coast	08B	22,767
Nass, coast	08C	49,997
Skeena, coast	08D	29,036
Central coastal waters, British Columbia	08E	55,751
Southern coastal waters, British Columbia	08F	54,658
Vancouver Island	08G	41,986
Nechako	08H	34,882
Upper Fraser	08J	47,332
Thompson	08K	67,088
Lower Fraser	08L	55,777
Columbia	08M	61,880
Queen Charlotte Islands	08N	102,925
Skagit	08O	10,049
Pacific total	08P	1,027
Yukon River	...	666,349
Headwaters Yukon	9	
Pelly	09A	94,018
Upper Yukon	09B	50,485
Stewart	09C	44,206
Central Yukon	09D	51,360
Porcupine	09E	29,820
Tanana	09F	61,566
Copper	09G	1,470
Yukon River total	09H	4,112
Arctic	...	337,036
Upper Liard	10	
Central Liard	10A	61,858
Fort Nelson	10B	72,031
Central Liard and Petitot	10C	54,771
Lower Liard	10D	30,563
Upper Mackenzie, Mills Lake	10E	55,571
Upper Mackenzie, Camsell Bend	10F	51,042
Central Mackenzie, Blackwater Lake	10G	57,858
Great Bear	10H	67,210
Central Mackenzie, The Ramparts	10J	158,140
Lower Mackenzie	10K	46,736
Peel and Southwestern Beaufort Sea	10L	77,259
Southern Beaufort Sea	10M	107,693
Amundsen Gulf	10N	99,387
Coppermine	10O	91,087
Coronation Gulf and Queen Maud Gulf	10P	50,741
Back	10Q	174,679
Gulf of Boothia	10R	135,956
Southern Arctic Islands	10S	114,752
Baffin Island, Arctic drainage	10T	373,180
Northern Arctic Islands	10U	299,813
Arctic total	10V	424,812
Mississippi River	...	2,605,138
Missouri	11	
Mississippi River total	11A	27,097
Canada total	...	9,976,182

1. A sub-drainage area, also called a watershed or drainage basin, is an area where all contributing surface waters share the same drainage outlet. Drainage areas channel runoff from precipitation and snow melt into stream flow. The resulting hierarchy of streams and rivers and their associated sub-drainage areas form the National Hydrological Network of Canada. There are 11 major drainage areas and 164 sub-drainage areas in Canada. Canada's entire land and fresh water area has been allocated to individual drainage areas.

Source(s): Natural Resources Canada, 2005, National Scale Frameworks Hydrology - Drainage Areas, Canada, Version 5.0, <http://www.geografis.gc.ca> (accessed June 21, 2007).

Table 2.3
Water resource characteristics by major river basin¹

	Major river basin	Total area ²		Water area ³		
		code	square kilometres	Total	As a share of total	
Canada	...	9,978,904	1,174,452	11.8	39,139	
Pacific Coastal	1	334,452	15,041	4.5	10,944	
Fraser - Lower Mainland	2	233,105	9,015	3.9	4,462	
Okanagan - Similkameen	3	15,603	650	4.2	2,279	
Columbia	4	87,321	2,482	2.8	15,457	
Yukon	5	332,906	9,329	2.8	343,653	
Peace - Athabasca	6	485,146	16,725	3.4	48,306	
Lower Mackenzie	7	1,330,481	176,937	13.3	3,623,373	
Arctic Coast - Islands	8	1,764,279	177,906	10.1	10,617,432	
Missouri	9	27,097	1,129	4.2	120,359	
North Saskatchewan	10	150,151	7,245	4.8	5,539	
South Saskatchewan	11	177,623	6,243	3.5	3,522	
Assiniboine - Red	12	190,705	9,098	4.8	6,665	
Winnipeg	13	107,654	20,599	19.1	247,350	
Lower Saskatchewan - Nelson	14	360,883	67,612	18.7	309,699	
Churchill	15	313,572	51,858	16.5	593,728	
Keewatin - Southern Baffin Island	16	939,568	161,438	17.2	13,416,290	
Northern Ontario	17	691,811	55,952	8.1	391,174	
Northern Quebec	18	940,194	148,986	15.8	1,426,559	
Great Lakes - St. Lawrence	19	582,945	134,928	23.1	7,624	
North Shore - Gaspé	20	369,094	37,363	10.1	74,117	
Saint John - St. Croix	21	41,904	1,800	4.3	4,481	
Maritime Coastal	22	122,056	6,728	5.5	4,469	
Newfoundland and Labrador	23	380,355	55,388	14.6	107,731	
	Major river basin	Total area ²		Mean annual streamflow ⁴		
		code	square kilometres	Rate	Total	
				cubic metres per second	thousands of cubic metres per square kilometre	
					percent	
Canada	...	9,978,904	105,135	3,315.50	332	100.0
Pacific Coastal	1	334,452	16,390	516.9	1,545	15.6
Fraser - Lower Mainland	2	233,105	3,972	125.3	537	3.8
Okanagan - Similkameen	3	15,603	74	2.3	150	0.1
Columbia	4	87,321	2,009	63.4	726	1.9
Yukon	5	332,906	2,506	79	237	2.4
Peace - Athabasca	6	485,146	2,903	91.5	189	2.8
Lower Mackenzie	7	1,330,481	7,337	231.4	174	7.0
Arctic Coast - Islands	8	1,764,279	8,744	275.8	156	8.3
Missouri	9	27,097	12	0.4	14	0.0
North Saskatchewan	10	150,151	234	7.4	49	0.2
South Saskatchewan	11	177,623	239	7.5	42	0.2
Assiniboine - Red	12	190,705	50	1.6	8	0.0
Winnipeg	13	107,654	758	23.9	222	0.7
Lower Saskatchewan - Nelson	14	360,883	1,911	60.3	167	1.8
Churchill	15	313,572	701	22.1	70	0.7
Keewatin - Southern Baffin Island	16	939,568	5,383	169.8	181	5.1
Northern Ontario	17	691,811	5,995	189.1	273	5.7
Northern Quebec	18	940,194	16,830	530.8	565	16.0
Great Lakes - St. Lawrence	19	582,945	7,197	227	389	6.8
North Shore - Gaspé	20	369,094	8,159	257.3	697	7.8
Saint John - St. Croix	21	41,904	779	24.6	586	0.7
Maritime Coastal	22	122,056	3,628	114.4	937	3.5
Newfoundland and Labrador	23	380,355	9,324	294	773	8.9

See footnotes at the end of the table.

Table 2.3 – continued

Water resource characteristics by major river basin¹

Major river basin	Total area ²		Mean annual precipitation ⁵		Dams	
	code	square kilometres	Rate	Volume	Number	Generating capacity
Canada	...	9,978,904	545	5,451	1,462	67,411
Pacific Coastal	1	334,452	1,354	451	50	1,648
Fraser - Lower Mainland	2	233,105	670	156	24	848
Okanagan - Similkameen	3	15,603	466	7	3	594
Columbia	4	87,321	776	68	56	5,153
Yukon	5	332,906	346	115	10	76
Peace - Athabasca	6	485,146	497	241	17	3,427
Lower Mackenzie	7	1,330,481	365	486	18	83
Arctic Coast - Islands	8	1,764,279	189	333	0	0
Missouri	9	27,097	390	11	2	13
North Saskatchewan	10	150,151	443	67	6	504
South Saskatchewan	11	177,623	419	74	21	310
Assiniboine - Red	12	190,705	450	86	3	168
Winnipeg	13	107,654	683	74	98	905
Lower Saskatchewan - Nelson	14	360,883	508	183	60	4,941
Churchill	15	313,572	480	151	12	119
Keewatin - Southern Baffin Island	16	939,568	330	310	0	0
Northern Ontario	17	691,811	674	466	60	1,116
Northern Quebec	18	940,194	698	656	66	15,238
Great Lakes - St. Lawrence	19	582,945	957	556	623	12,515
North Shore - Gaspé	20	369,094	994	367	129	10,785
Saint John - St. Croix	21	41,904	1,147	48	54	1,864
Maritime Coastal	22	122,056	1,251	153	60	411
Newfoundland and Labrador	23	380,355	1,030	392	90	6,693

1. These major river basins and associated flow measures are adapted from Laycock (1987) (see full reference below). Some of these river basin aggregates have more than one outflow.

2. Area includes the Canadian portion of the Great Lakes.

3. Water area figures are calculated from the Canada-wide 1 km² water fraction derived from National Topographic Database maps.

4. Basins at the US-Canada border exclude inflow from U.S. portion of basin region.

5. Precipitation has been estimated from an Inverse Distance Weighted (IDW) interpolation of the 1971 to 2000 normals.

6. The generating capacity refers to the maximum power capability from hydro plants. The survey coverage for those plants is limited to those utilities and companies which have at least one plant with a total generating capacity of over 500 kilowatts.

Source(s): Environment Canada, 2003, Canadian Climate Normals, 1971 to 2000, Meteorological Service of Canada, http://climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed February 23, 2005). Pearse, P.H., F. Bertrand and J.W. McLaren, 1985, Currents of Change: Final Report of the Inquiry on Federal Water Policy, Environment Canada, Ottawa. Natural Resources Canada, no date, National Scale Frameworks Hydrology - Drainage Areas, Canada, http://geografis.cgd.gc.ca/download/frameworkdata/drainage_areas/ (accessed April 7, 2008). Laycock, A.H., 1987, "The Amount of Canadian Water and its Distribution", in Canadian Aquatic Resources, no. 215 of Canadian Bulletin of Fisheries and Aquatic Sciences, M.C. Healey and R.R. Wallace (eds.), 13-42, Fisheries and Oceans Canada, Ottawa. Natural Resources Canada, GeoAccess Division, 2003, 1:1 Million Digital Drainage Area Framework, version 4.8b. Statistics Canada, 2001 Census of Population. "Electric Power Generating Stations", catalogue no. 57-206-X.

Table 2.4
Distribution of streamflow, water area and 2006 population

	Streamflow	Water area	Population
percent			
Canada	100.0	100.0	100.0
Newfoundland and Labrador	8.6	5.0	1.6
Prince Edward Island	0.1	0.1	0.4
Nova Scotia	1.2	0.5	2.9
New Brunswick	1.3	0.2	2.3
Quebec	21.6	18.6	23.9
Ontario	8.9	8.8	38.5
Manitoba	2.6	10.0	3.6
Saskatchewan	1.5	7.0	3.1
Alberta	1.9	2.6	10.4
British Columbia	24	3.0	13.0
Yukon Territory	4.2	1.0	0.1
Northwest Territories and Nunavut	24	43.3	0.2

Source(s): Laycock, A.H., 1987, "The Amount of Canadian Water and its Distribution," in Canadian Aquatic Resources, no. 215 of Canadian Bulletin of Fisheries and Aquatic Sciences, M.C. Healey and R.R. Wallace (eds.), 13-42, Fisheries and Oceans Canada, Ottawa. Natural Resources Canada, no date, National Scale Frameworks Hydrology - Drainage Areas, Canada, http://geografis.cgd.gc.ca/download/frameworkdata/drainage_areas/ (accessed April 7, 2008). Statistics Canada, CANSIM table 051-0001 and Census of Population 2006.

Table 2.5
Top ten Canadian weather stories of 2007

	Location	Time period	Rank ¹
Vanishing Ice at the Top of the World	Arctic	September	1
BC's Long Flood Threat	British Columbia	Spring	2
Pre-Winter Weather Mayhem from Coast to Coast	Various	December	3
Tropical Summer on the Prairies	Prairies	Summer	4
Oh So Dry in Southern Ontario	Ontario	Summer	5
Big Bad Noel but No Juan	Atlantic	July to November	6
Great Lakes - How Low Will They Go?	Canada	All year	7
A Winter That Wasn't - Almost!	Ontario	Winter	8
Record Prairie Hailers	Various	Summer	9
Canada's First F5 Tornado	Prairies	June	10
	Manitoba		

1. Canada's Top Weather Stories for 2007 are rated from one to ten based on the degree to which Canada and Canadians were impacted, the extent of the area affected, economic effects and longevity as a top news story.

Source(s): Environment Canada, 2008, Meteorological Service of Canada, Environment Canada's Top Weather Stories for 2007, http://www.ec.gc.ca/doc/smc-msc/m_110/toc_eng.html (accessed January 24, 2008).

Table 2.6
Average daily temperatures by month for selected weather stations, 1971 to 2001

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
average daily temperature in Celsius degrees													
Goose Bay, Newfoundland and Labrador	-18.1	-16.3	-9.6	-1.7	5.1	11.0	15.4	14.5	9.2	2.4	-4.5	-13.9	-0.5
Gander, Newfoundland and Labrador	-7.4	-7.9	-4.0	1.3	6.7	11.6	16.0	15.7	11.4	5.8	1.0	-4.3	3.8
St. John's, Newfoundland and Labrador	-4.8	-5.4	-2.5	1.6	6.2	10.9	15.4	15.5	11.8	6.9	2.6	-2.2	4.7
Charlottetown, Prince Edward Island	-8.0	-7.8	-3.1	2.7	9.1	14.6	18.5	18.1	13.6	7.8	2.3	-4.1	5.3
Sydney, Nova Scotia	-5.7	-6.5	-2.7	2.1	7.8	13.3	17.7	17.7	13.4	8.0	3.3	-2.1	5.5
Halifax, Nova Scotia	-6.0	-5.6	-1.4	4.0	9.8	15.0	18.6	18.4	14.1	8.3	3.1	-2.8	6.3
Yarmouth, Nova Scotia	-3.0	-3.0	0.3	4.9	9.7	13.7	16.5	16.9	13.8	9.1	4.8	-0.2	7.0
Moncton, New Brunswick	-8.9	-8.0	-2.9	3.2	9.9	15.1	18.6	17.9	13.0	7.1	1.4	-5.5	5.1
Saint John, New Brunswick	-8.1	-7.3	-2.5	3.6	9.4	14.0	17.1	16.9	12.8	7.3	2.0	-4.7	5.0
Chapais 2, Quebec	-18.8	-16.6	-9.5	-0.5	7.9	14.0	16.3	14.9	9.3	2.9	-5.4	-14.8	0.0
Kuujjuarapik, Quebec	-24.3	-23.6	-18.3	-9.1	0.3	7.2	11.5	10.6	5.6	-0.7	-8.4	-19.3	-5.7
Kuujjuarapik, Quebec	-23.4	-23.2	-17.3	-7.6	1.3	7.0	10.6	11.4	7.4	2.1	-5.0	-16.2	-4.4
Québec, Quebec	-12.8	-11.1	-4.6	3.3	11.2	16.5	19.2	17.9	12.5	6.2	-0.7	-9.1	4.0
Sept-Îles, Quebec	-15.3	-13.4	-7.1	0.0	5.9	11.7	15.3	14.2	9.3	3.4	-3.1	-11.3	0.8
Montréal, Quebec	-10.4	-9.0	-2.5	5.5	12.9	17.7	20.5	19.2	13.9	7.5	1.0	-6.8	5.8
Ottawa, Ontario	-10.8	-8.7	-2.5	5.7	13.4	18.3	20.9	19.5	14.3	7.8	1.0	-7.1	6.0
Kapuskasing, Ontario	-18.7	-15.5	-8.6	0.5	9.0	14.4	17.2	15.7	10.1	3.8	-4.8	-14.3	0.7
Thunder Bay, Ontario	-14.8	-12.0	-5.5	2.9	9.5	14.0	17.6	16.6	11.0	5.0	-3.0	-11.6	2.5
Toronto, Ontario	-6.3	-5.4	-0.4	6.3	12.9	17.8	20.8	19.9	15.3	8.9	3.2	-2.9	7.5
Windsor, Ontario	-4.5	-3.2	2.0	8.2	14.9	20.1	22.7	21.6	17.4	11.0	4.6	-1.5	9.4
The Pas, Manitoba	-20.6	-16.1	-8.9	1.0	9.0	14.8	17.7	16.5	10.0	3.1	-7.8	-17.4	0.1
Winnipeg, Manitoba	-17.8	-13.6	-6.1	4.0	12.0	17.0	19.5	18.5	12.3	5.3	-5.3	-14.4	2.6
Churchill, Manitoba	-26.7	-24.6	-19.5	-9.7	-0.7	6.6	12.0	11.7	5.6	-1.7	-12.6	-22.8	-6.9
Regina, Saskatchewan	-16.2	-11.9	-5.0	4.5	11.7	16.4	18.8	18.0	11.7	4.8	-5.5	-13.2	2.8
Saskatoon, Saskatchewan	-17.0	-13.0	-5.8	4.4	11.5	16.0	18.2	17.3	11.2	4.5	-6.2	-14.3	2.2
Calgary, Alberta	-8.9	-6.1	-1.9	4.6	9.8	13.8	16.2	15.6	10.8	5.4	-3.1	-7.4	4.1
Edmonton, Alberta	-13.5	-10.5	-4.5	4.3	10.4	14.1	15.9	15.1	10.1	4.3	-5.7	-11.3	2.4
Victoria, British Columbia	3.8	4.9	6.4	8.8	11.8	14.4	16.4	16.4	14.0	9.8	6.1	4.0	9.7
Penticton, British Columbia	-1.7	0.7	4.7	9.0	13.6	17.4	20.4	20.1	14.9	8.7	3.1	-1.1	9.2
Vancouver, British Columbia	3.3	4.8	6.6	9.2	12.5	15.2	17.5	17.6	14.6	10.1	6.0	3.5	10.1
Prince Rupert, British Columbia	1.3	2.5	3.9	6.0	8.7	11.1	13.1	13.5	11.3	7.9	4.1	2.2	7.1
Prince George, British Columbia	-9.6	-5.4	-0.3	5.2	9.9	13.3	15.5	14.8	10.1	4.6	-2.9	-7.8	4.0
Mayo, Yukon Territory	-25.7	-19.0	-9.6	0.9	8.4	14.0	16.0	13.1	6.4	-2.9	-15.9	-22.3	-3.1
Whitehorse, Yukon Territory	-17.7	-13.7	-6.6	0.9	6.9	11.8	14.1	12.5	7.1	0.6	-9.4	-14.9	-0.7
Inuvik, Northwest Territories	-27.6	-26.9	-23.2	-12.8	0.2	11.3	14.2	11.0	3.7	-8.2	-21.0	-25.7	-8.8
Yellowknife, Northwest Territories	-26.8	-23.4	-17.3	-5.3	5.6	13.5	16.8	14.2	7.1	-1.7	-13.8	-23.7	-4.6
Resolute, Nunavut	-32.4	-33.1	-30.7	-22.8	-10.9	-0.1	4.3	1.5	-4.7	-14.9	-23.6	-29.2	-16.4
Alert, Nunavut	-32.3	-33.4	-32.4	-24.3	-11.8	-0.8	3.3	0.8	-9.2	-19.3	-26.4	-30.0	-18.0
Clyde, Nunavut	-28.1	-29.6	-27.2	-19.0	-8.5	0.7	4.4	3.9	0.0	-7.6	-17.5	-24.8	-12.8
Iqaluit, Nunavut	-26.6	-28.0	-23.7	-14.8	-4.4	3.6	7.7	6.8	2.2	-4.9	-12.8	-22.7	-9.8
Baker Lake, Nunavut	-32.3	-31.5	-27.2	-17.4	-5.8	4.9	11.4	9.5	2.6	-7.5	-20.1	-28.4	-11.8

1. Averaged over the period 1971 to 2000.

Source(s): Environment Canada, 2004, National Climate Data and Information Archive, Canadian Climate Normals or Averages, 1971-2000, http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed June 22, 2007).

Table 2.7

Annual regional temperature departures from climate normal, trends and extremes, 1948 to 2007

	Trend ²		Extreme years				Annual 2007 ³	
			Coldest		Warmest		Rank ⁴	Departure ³ degrees Celsius
	Year on record	Departure ³ degrees Celsius	Year on record	Departure ³ degrees Celsius	number			
	degrees Celsius	90% Confidence interval ⁵	year	degrees Celsius	year	degrees Celsius	number	degrees Celsius
Canada 1	1.4	0.7 to 1.7	1972	-1.8	1998	2.5	13	0.9
Atlantic Canada	0.2	n.s.s. ⁶	1972	-1.4	1999	2.0	26	0.1
Great Lakes/St. Lawrence Lowlands	0.6	n.s.s. ⁶	1978	-1.0	1998	2.3	14	0.7
Northeastern Forest	0.8	n.s.s. ⁶	1972	-1.9	2006	2.3	14	0.6
Northwestern Forest	1.8	0.9 to 2.4	1950	-2.1	1987	3.0	22	0.8
Prairies	1.5	0.7 to 2.2	1950	-2.1	1987	3.1	17	1.0
South British Columbia Mountains	1.5	1.1 to 2.1	1955	-1.8	1998	2.0	19	0.8
Pacific Coast	1.2	0.8 to 1.7	1955	-1.2	1958	1.6	27	0.3
North British Columbia Mountains/Yukon	2.1	1.3 to 2.9	1972	-2.1	2005	2.8	31	0.9
Mackenzie District	2.1	1.3 to 2.8	1982	-1.5	1998	3.9	18	1.0
Arctic Tundra	1.6	0.7 to 2.1	1972	-2.4	2006	3.4	11	1.1
Arctic Mountains and Fiords	1.1	0.2 to 1.7	1972	-1.9	2006	2.3	6	1.6

1. The climate regions of Canada are illustrated in Map 2.5.

2. A linear (least square) trend over the period of record.

3. Difference from the normal temperature.

4. This column ranks 2007 temperature departures over the period between 1948 and 2007. For example, the Atlantic Canada Climate Region had a departure that was 0.1°C warmer than the long term temperature average, which ranked the 2007 season as the 26th warmest over the 60 year period.

5. 90% confidence interval obtained by a nonparametric technique.

6. Not statistically significant.

Source(s): Environment Canada, Meteorological Service of Canada, Climate Research Branch, 2008, Climate Trends and Variations Bulletin for Canada, Annual 2007, http://www.msc.ec.gc.ca/ccrm/bulletin/archive_e.cfm (accessed January 11, 2008).

Section 3

Annual statistics: Pressures on Canada's environment

3.1 Driving forces

Driving forces are the conditions and activities that shape the relationship between human activities and the environment. Topics covered in this section include population, economic conditions, transportation, natural resources and ecosystems.

3.2 Population

Population growth, distribution and density are major factors in determining the impacts that human activities have on the environment. Canada's population has expanded considerably since 1901, when there were 5.4 million Canadians (Table 3.1). By 2006, the population had grown six-fold, reaching over 32 million people. However, growth rates have not been consistent over time. Two historical periods were characterized by high annual population growth rates. The first was from 1901 to 1911, when massive immigration resulted in annual growth rates of up to 3%. The second period of high growth followed the end of the Second World War and is generally referred to as the 'baby boom'. In contrast to these two periods of population growth, two periods of slow economic activity (1891 to 1901 and 1931 to 1941) coincided with a slump in population growth rates. Since 1957, when the annual growth rate was 3.3%, growth rates have been decreasing, fluctuating between 1% and 1.8% from 1970 to 2006.

The growth of Canada's population is the result of two factors: natural increase and international migration. Since 1995-1996, international migration has become a more important component of population growth than natural increase. In 2006-2007, international migration accounted for 65% of the annual increase (Table 3.2).

Tables 3.3 and 3.4 present population by ecozone, illustrating the unevenness of Canada's population distribution. In 2006, the average population density

for Canada was 359 persons per 100 km², ranging from 0.2 persons per 100 km² in the Taiga Cordillera to 15,522.4 persons per 100 km² in the Mixed Wood Plains. (Table 3.3).

Table 3.5 presents population characteristics by major river basin. Table group 3.6 presents population by sub-drainage area.¹

3.3 Economy

The economy is a strong driving force for changes in the environment. Gross domestic product (GDP) measures the total value of goods and services produced in Canada. Goods-producing industries—such as manufacturing, construction and resource industries—accounted for 31% of GDP in 2007 and 24% of employment. Service-producing industries—from wholesale and retail trade to health care—made up the remaining 69% of GDP and 76% of employment (Tables 3.7 and 3.8).

Table 3.9 outlines the changes in the composition of exports and imports from 1972 to 2007. Over the period, agricultural and fishing products' share of total exports decreased from 12.6% to 7.4% and forestry products' share fell from 17.1% to 6.2%. With Canada becoming an important energy producer, energy exports took up the slack. Exports of energy products moved from 8.2% to 19.7% of total exports from 1972 to 2007. At the same time, the share of energy imports grew from 5.7% to 8.8%.

3.4 Transportation

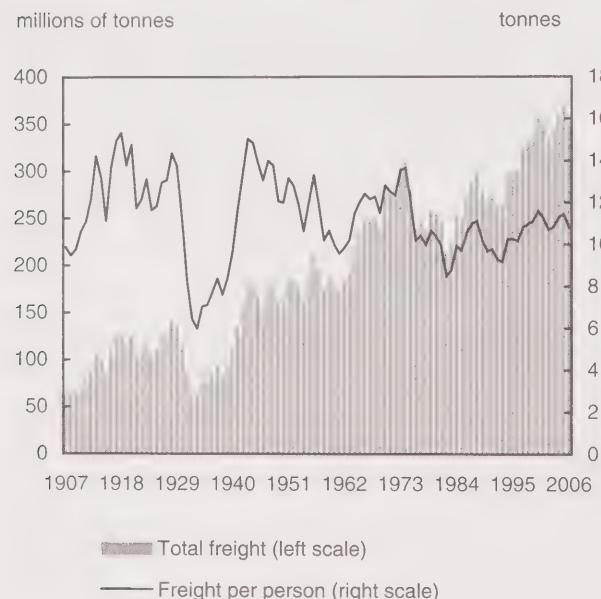
Transportation fulfils an essential role in maintaining Canada's economic and social well-being. Bringing

1. A sub-drainage area, also called a watershed or drainage basin, is an area where all contributing surface waters share the same drainage outlet. Drainage areas channel runoff from precipitation and snow melt into stream flow. The resulting hierarchy of streams and rivers and their associated sub-drainage areas form the National Hydrological Network of Canada. There are 11 major drainage areas and 164 sub-drainage areas in Canada. Canada's entire land and fresh water area has been allocated to individual drainage areas. See Map 2.3 and Table 2.2 for classification codes and area figures for these sub-drainage areas.

goods to market and getting people from place to place, transportation refers to the transport of goods and commercial passengers, as well as private transport.

The Tables 3.10, 3.11, 3.12 and 3.13 and Chart 3.1 outline the tonnage of goods transported by water, rail, truck and air transport. In 2004, 452.3 million tonnes of goods were moved by water compared to 374.1 million tonnes by rail, 306.1 million tonnes by truck, and 694.5 thousand tonnes by air. Water transport also led other modes on a tonne-kilometre basis—which takes into account weight of shipment and distance transported—at 2.0 trillion tonne-kilometres in 2004, compared to 344 billion for rail, 193 billion for trucking and 2 billion for air.

Chart 3.1
Railroad freight shipped 1907 to 2001



Source(s): Historical Statistics of Canada, M.C. Urquhart, Catalogue no. HA746 U7, Toronto; 1965, Historical Statistics of Canada, 1983, Second Edition, F.H. Leacy, Catalogue no. 11-516-X; Canada Year Book, Catalogue nos. CS11-202/1978, CS11-402E/1981, CS11-402E/1985, CS11-402E/1988 and CS11-402E/1990 and CANSIM tables 051-0001, 075-0001 and 404-0016.

While the majority of freight is indeed moved by water and rail, the importance of trucking to freight transport has grown substantially. A contributing factor to increasing truck traffic on roads is the concept of 'just-in-time' delivery of freight, where parts and products are scheduled to arrive as they are needed.

For the for-hire trucking industry, tonnes of freight carried grew by 61% from 1989 to 2004, while tonne-kilometres grew by 150% (Table 3.12).

Since the early 20th century, the amount of freight shipped by rail has grown steadily, with the exception of the depression years (Chart 3.1). While rail freight per person has fluctuated greatly, its overall trend has been flat over the whole of this period.

The most recent published data show that in 2006, 51.9 million passengers were transported by Canadian air transport carriers (Table 3.13). Passenger-kilometers (derived by multiplying the number of passengers by the distance travelled) for air transport grew to 121 billion in 2006. Trains carried 4.2 million passengers in 2006, while passenger-kilometers reached almost 1.5 billion (Table 3.11). In 2004, 38.7 million passengers were transported by ferry, 10% below a high of 43.2 million reached in 1994 (Table 3.10).

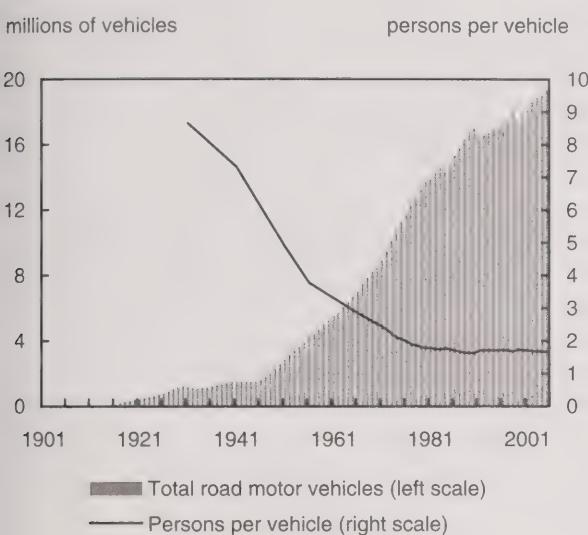
The number of road motor vehicle registrations increased by 14% between 2000 and 2007, reaching over 20 million vehicles. Since 2000, the number of vehicles weighing less than 4,500 kg has increased by 2.1 million to 19.2 million, accounting for 93% of all registered road motor vehicles (Table 3.14). As the number of vehicles on the road increased over the course of the twentieth century, the number of persons per vehicle declined. There were 8.6 persons for each vehicle registered in 1931; by the mid-1980's this number had fallen to about 1.7 persons per vehicle (Chart 3.2).

Across the country, driving to work is by far the most popular commuting method (Table 3.15). However, some regional differences exist: for example, public transportation is most popular in Montreal, Ottawa-Hull and Toronto; more than 10% of people get to work by walking in Halifax, Kingston and Victoria; and 4.8% of workers bicycle to work in Victoria, more than any other census metropolitan area (CMA) (Table 3.16).

The majority (69%) of petroleum products used for transportation in 2006 were sold through retail pump sales. While most retail pump sales are made to individuals, some commercial vehicles including taxis and fleet vehicles also purchase retail fuel. The road transport and urban transit industries used another 13% of petroleum products, compared to 10% for airlines, 4% for marine and 4% for railways (Table 3.17).

Almost 59 thousand vehicles were in use by passenger bus and urban transit industries in 2005, 59% of which were used to transport students to school and employees to work. Urban transit vehicles made up a further 27%. Urban transit vehicles used 52% of the diesel fuel consumed by passenger bus and urban transit industries in 2005. School and employee buses consumed 28% of diesel fuel and 51% of gasoline (Table 3.18).

Chart 3.2
Road motor vehicles



Note(s): In 1999, Statistics Canada changed the data collection methodology for road motor vehicles. Some of the difference in the vehicle trend may be attributable to this methodological change.

Source(s): Canadian Political Science Association and Social Science Research Council of Canada, 1965, *Historical Statistics of Canada*, M.C. Urquhart, Catalogue no. HA746 U7, Toronto, 1983, *Historical Statistics of Canada*, Second Edition, F.H. Leacy (ed.), Catalogue no. 11-516-X; CANSIM tables 405-0001, 405-0004 and 051-0001.

3.5 Natural resources

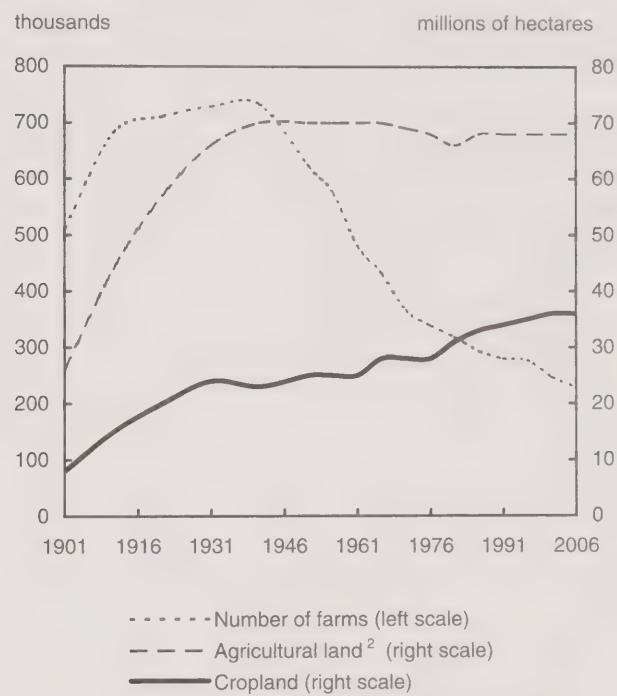
This section examines one of the main sources of impacts on the environment – natural resource consumption. The statistics presented here on agriculture, fisheries, forestry, minerals and energy, provide an indication of the role that Canada's environment plays as a source of natural resources.

3.5.1 Agriculture

The number of farms in Canada increased between 1871 and 1941 from 367,862 to 732,832. Since then the number has been declining. In 2006 there were 229,373 farms in Canada (Table 3.19). Chart 3.3 illustrates that while the total area of agricultural land remained stable at 68 million hectares, the area of cropland increased to 36 million hectares. The average farm size increased from 113 hectares in 1951 to 295 hectares in 2006.

Charts 3.4 and 3.5 present the production of selected field crops and small grains, while chart 3.6 presents livestock inventories.

Chart 3.3
Number of farms, agricultural land and cropland¹

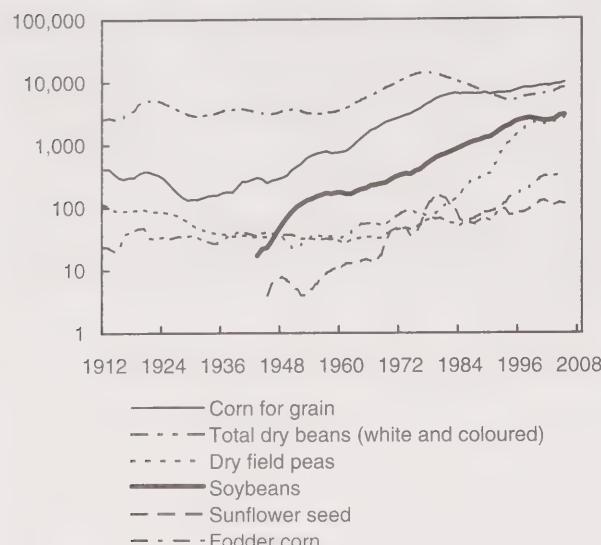


1. The definition of a census farm changed over the years, affecting the comparability of data among censuses.
2. Data for 1901 and 1911 includes all improved land.

Source(s): Statistics Canada, *Selected Historical Data from the Census of Agriculture*, Catalogue no. 95-632-X, table 1.1 and 1961 Census of Canada, *Agriculture*, Bulletin 5.1 – 1, Catalogue no. 96-530-X (Vol: V – Part:1).

Chart 3.4
Selected field crop production (five-year averages)

thousand tonnes (log scale)



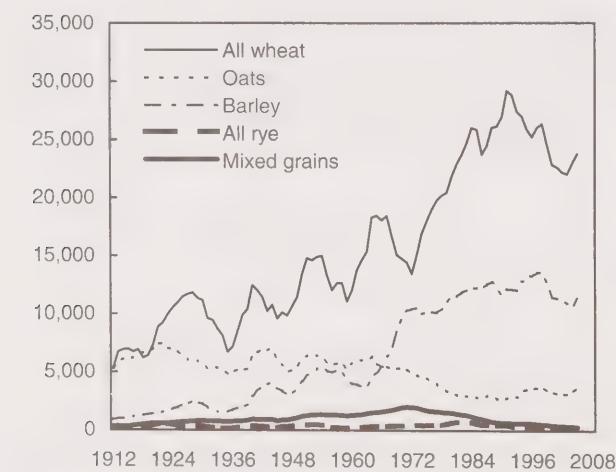
1. Data from 1908 to 2005 are used to create the five-year averages.

Source(s): CANSIM table 001-0010.

Chart 3.5

Production of small grains (five-year averages)

thousands of tonnes

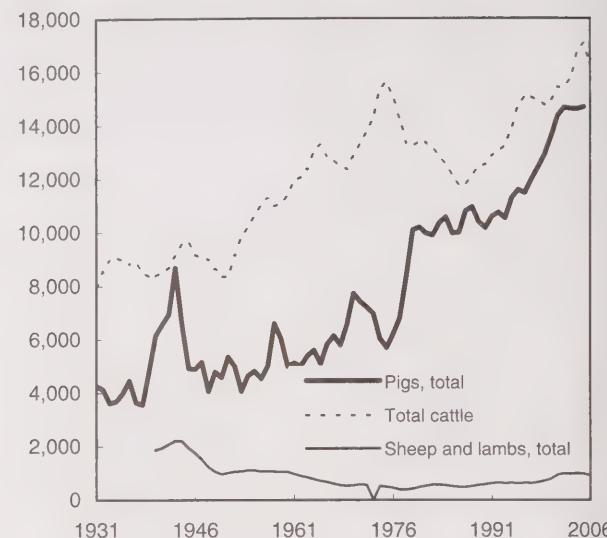


1. Data from 1908 to 2005 are used to create the five-year averages.

Source(s): CANSIM table 001-0010.

Chart 3.6
Selected livestock populations

in thousands



Source(s): CANSIM tables 003-0032, 003-0031 and 003-0004.

3.5.2 Fisheries

Despite declines in fish stocks during the last part of the twentieth century, Canadian fisheries continue to play an important role in communities in Atlantic Canada and British Columbia. Fishing industries contributed 0.17% or \$2.1 billion to total GDP in 2007 (Table 3.20) and they employed nearly forty-nine thousand people, 0.29% of total employment in Canada in 2007 (Table 3.21).

Exports and imports of fish and fish products are presented in Table 3.22. Canada continues to be a net exporter of these products, with exports of \$4.5 billion and imports of \$1.8 billion in 2006.

After a steady decline throughout the early 1990s, the total catch of fish and shellfish has remained relatively stable, with slightly over 1.0 million tonnes, worth almost \$1.9 billion, caught in 2006 (Table 3.23). Aquaculture production increased to almost 171 thousand tonnes in 2006, worth almost \$903 million, a 28% increase in value from the previous year (Table 3.24).

3.5.3 Forestry

Logs and bolts—the raw material from which lumber, plywood and other wood products are produced—account for the bulk of wood harvested from forests each year, with pulpwood making up most of the remainder (Table 3.25). British Columbia continued to dominate the forest industry in 2005, harvesting 46% of the total volume of wood cut. Quebec, Alberta and Ontario harvested an additional 47% of the total. (Table 3.26).

Gross domestic product (GDP) for the forest products industries fell to \$21.1 billion dollars or 1.7% of total GDP in 2007 (Table 3.27).

Dampened by the lingering impact of the softwood lumber dispute with the United States and further impacted by the recent rapid appreciation of the Canadian dollar, employment in the forest products industries declined for a seventh consecutive year in 2007, falling to 178 thousand (Table 3.28).

Forest products exports made continuous gains from 1987 to 2000, but have since trended downward, reaching a level of \$34 billion in 2006. As a share of total exports, forest products declined from 16.7% in 1987 to 7.7% in 2006 (Table 3.29).

3.5.4 Minerals

The mineral industries include the extraction and production of metallic minerals such as copper, gold, iron, nickel, silver and zinc; mineral fuels including coal, crude petroleum and natural gas; and other minerals including potash, sand, and gravel. In 2007, mining and oil and gas extraction industries contributed 4.8% to GDP while petroleum and coal products and selected primary mineral manufacturing contributed another 1.0% (Tables 3.30 and 3.32).

In 2006, total employment in the mining and oil and gas extraction industries reached 182,564 (Table 3.31). Since 1992, Alberta's share of total employment in the mining and oil and gas extraction industries has risen from 43% to 59%.

In 2006, crude petroleum production in Canada reached over \$54 billion. In the same year, nearly \$55 billion worth of natural gas was extracted, with the majority coming from the western provinces.

Metal production totalled \$21.2 billion (Table 3.33). Tables 3.34 and 3.35 detail reserves and production of selected minerals.

3.5.5 Energy

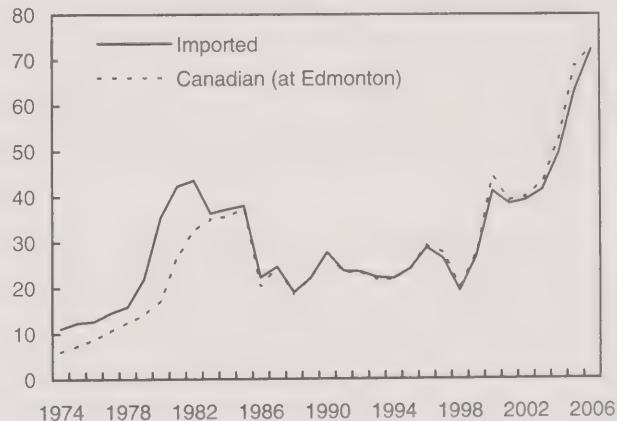
Energy resources such as coal, crude oil, natural gas, hydro power and uranium have transformed society, fuelling economic growth and industrial activity. They have provided the means to heat and light our homes, travel and transport goods with ease.

Canadians are consuming more energy than ever before. Growing an average of 1% per year during the previous two decades, energy consumption in Canada reached 344 gigajoules per person by 2006. By contrast, energy consumption per dollar of inflation-adjusted (real) gross domestic product (GDP) has fallen since the 1974 oil crisis (Table 3.36).

Since 1980, primary energy production has more than doubled to 16.8 million TJ in 2006, driven by increases in the production of natural gas and crude oil (Table 3.37). Energy products have become an increasingly large component of Canadian exports. By 2004, energy exports rose to 8,814 PJ, up from 2,068 PJ in 1980 (Chart 3.8). Meanwhile, record-high crude oil prices provide further incentive for energy producers to ramp up production (Chart 3.7).

Chart 3.7
Crude oil prices, 1974 to 2005

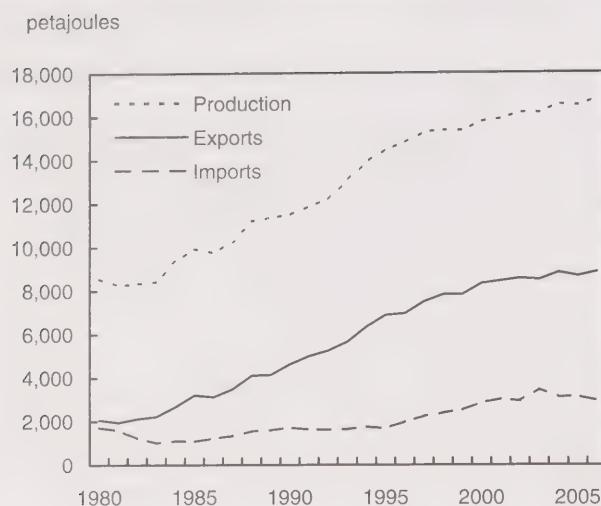
CAN\$ per barrel



Source: Natural Resources Canada, Oil Division.

Chart 3.37

Primary energy production, exports and imports



Source(s): CANSIM tables 128-0002 and 128-0009.

Table 3.38 outlines Canadian energy resource reserves of coal, crude oil, crude bitumen, natural gas and uranium. Established crude oil reserves declined by 30% from 1976 to 2006. As a result of the decline, the reserve life of crude oil fell from about 14 years in 1976 to 9 years in 2006. In contrast, established reserves of crude bitumen increased twenty-two fold from 1976 to 2006.

In 2005, 604.5 million MWh of electricity was generated at hydro-electric, thermal-electric, nuclear, and wind and tidal generating stations. Quebec and British Columbia were the largest hydro-electric power generators, followed by Newfoundland and Labrador, Manitoba and Ontario. Alberta and Ontario were the leading generators of thermal-electric energy, while Ontario generated 90% of Canada's nuclear power. Most wind energy was generated in Pincher Creek, Alberta and in the Gaspé region of Quebec (Table 3.39).

Hydro-electric facilities generated 364,504 GWh of electricity in 2007, accounting for 60% of total electric power generation in Canada (Table 3.40). Coal, the predominant source of fuel for thermal-electric power production in Canada (Table 3.41), accounted for 68% of electricity generated at thermal-electric power stations in 2005 (Table 3.42). Across Canada, the efficiency of thermal electric power plants ranged from 24% to 36%, depending on the type of fuel consumed (Table 3.43).

3.6 Ecosystems

Human activity has had a profound impact on the structure and function of many ecosystems. Natural areas are altered by human activities which contributes to loss of habitats and extinction of animal and plant species. This section focuses on the impacts human activities have on air, land, water and wildlife.

3.6.1 Air

The atmosphere, an envelope of gases surrounding the earth, is made up of nitrogen (78%), oxygen (21%) argon (0.9%) and other gases. The atmosphere provides the air we breathe, shields us from ultraviolet radiation, affects air circulation and weather patterns and keeps the earth warm.

Human activities can affect both the air and the atmosphere. Traffic emissions affect urban air quality; industrial emissions of sulphur oxides and nitrogen oxides can lead to acid rain; chlorofluorocarbons, hydrochlorofluorocarbons and other substances deplete the ozone layer; and carbon dioxide, methane and nitrous oxide contribute to climate change.

Air pollutants have a negative impact on the air we breathe and also have an effect on soil and water systems through acid deposition and other means. Effects can be local or global, as pollution travels with prevailing winds. Criteria air contaminants are those for which ambient air quality standards have been established by government. In 2005, criteria air contaminants including sulphur oxides, carbon monoxide, nitrogen oxides, volatile organic compounds and particulate matter made up nearly 94% of pollutants released by industrial facilities to air (Table 3.44).

Table 3.45 breaks down criteria air contaminant emissions for 2005, by source. Industrial sources were responsible for the highest emissions of sulphur oxides and volatile organic compounds and were the second highest emitters of particulate matter, after open sources. The majority of nitrogen oxides and carbon monoxide emissions came from transportation.

Greenhouse gases (GHGs) help regulate the planet's climate by trapping solar energy as it is radiated back from the Earth. Emissions of GHGs from human activities over the past 200 years have amplified this natural process and could impact global climate conditions. While criteria air contaminants persist in

the environment for a relatively short time (from less than a day to a few weeks), the effects of greenhouse gases may not be realised for much longer periods of time.

Table 3.46 compares emissions of common GHGs: carbon dioxide, methane and nitrous oxide by source for 1990 and 2005. Greenhouse gas emissions reached 747 megatonnes in 2005, 25% higher than in 1990. The increase was driven by growth in emissions from electricity and heat generation, the fossil fuel industries, transportation and mining. GHG emissions declined for the chemical, pulp & paper and construction industries.

3.6.2 Land

Canada is the second largest country in the world, with over 9.9 million square kilometres of land.² This land supports many uses, from agriculture and forestry to urban development, parks and recreation.

Table 3.48 presents the area of forest harvested by province and territory from 1975 to 2006, while Table 3.49 shows the area of timber-productive forest land burned from 1980 to 2006.

Fertilizers and manure supply the nitrogen, phosphorus and potassium and other nutrients that are essential for plant growth. The application of manure also adds needed organic matter to soil. Care must be taken to ensure that fertilizers and manure are applied correctly, in a way that minimizes the risk of runoff. In 2006, Canadian farmers applied fertilizer to over 253 thousand km² of land to improve crop yield, an increase of 6% compared to 2001 (Table 3.50). Livestock produced an estimated 178 million tonnes of manure in 2001 (Table 3.51).

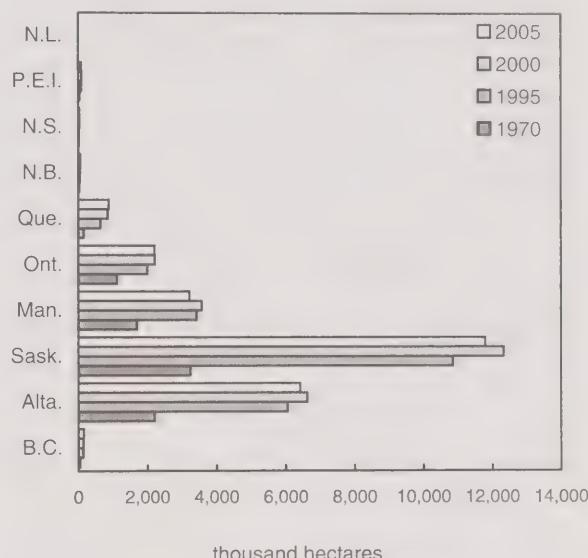
² Natural Resources Canada, 2004, "Land and Freshwater Areas," *The Atlas of Canada*, atlas.gc.ca/site/english/learningresources/facts/surfareas.html (accessed March 23, 2005).

Pesticides, including herbicides, insecticides and fungicides are used to control weeds, insects and crop diseases. The risk to the environment is determined by the mobility, persistence and toxicity of the pesticide to organisms other than its target, as well as the amount used. The area of farmland treated with pesticides is illustrated in charts 3.9 and 3.10.

The National Pollutant Release Inventory Database measures the volume of pollutants released on-site by over 8 thousand industrial facilities. In 2005, hydrogen sulphide made up more than 83% of the tonnage of substances released to land (Table 3.52).

Chart 3.9

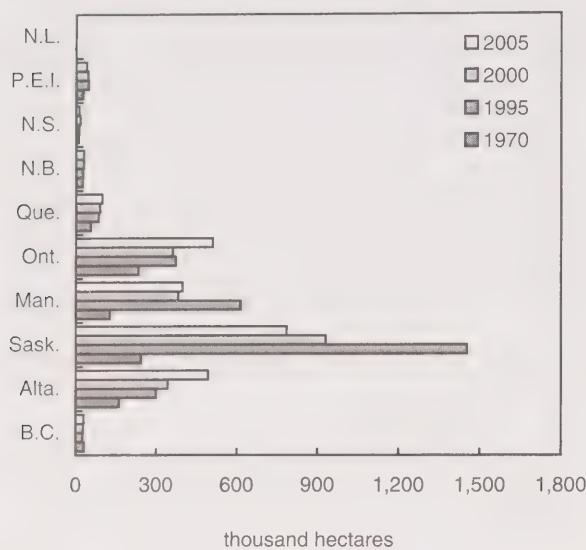
Area of farmland treated with herbicides by province



Note(s): As in previous censuses, the area of land on which herbicides, insecticides and fungicides were applied is under-reported. However, the data are comparable with previous censuses.

Source(s): Statistics Canada, Census of Agriculture, special tabulation, unpublished data and 2006 Census of Agriculture, *Selected Historical Data from the Census of Agriculture Catalogue* no. 95-632-X.

Chart 3.10
Area of farmland treated with insecticides by province



Note(s): For 1970, fungicides were also included. As in previous censuses, the area of land on which herbicides, insecticides and fungicides were applied is under-reported. However, the data are comparable with previous censuses.

Source(s): Statistics Canada, Census of Agriculture, special tabulation, unpublished data and 2006 Census of Agriculture, *Selected Historical Data from the Census of Agriculture Catalogue no. 95-632-X*.

3.6.3 Water

With 20% of the world's fresh water resources and 7% of the world's total renewable water flow, water remains a precious part of Canada's natural wealth.³ Used for power generation, transportation, recreation, irrigation, manufacturing, agriculture and drinking water, Canadian water use per capita is the second highest in the world.⁴ We also use our rivers, lakes and marine areas to dispose of municipal wastewater and wastes from industry. Some activities for which water is used can make it unfit for use by humans or wildlife.

Map 3.1 illustrates the proportion of surface fresh water that is used by Canadians within each of Canada's major drainage areas. Although responsible for only 14% of total water intake, the South Saskatchewan, Missouri and Assiniboine-Red and the North Saskatchewan river basins have the highest ratios of water intake to streamflow (Table 3.53).

3. Fresh Water Resources, *Human Activity and the Environment*, Catalogue no. 16-201-X.

4. *Ibid.*

Map 3.1

Water use and availability by major river basin



Source(s): Statistics Canada, Environment Accounts and Statistics Division.

The Great Lakes - St. Lawrence river basin also stands out with water intake of 30.6 billion m³, used mainly for industrial (89%) and municipal (10%) purposes. In contrast, 71% of total surface fresh water intake in the South Saskatchewan, Missouri and Assiniboine-Red river basin, 2.9 billion m³, was for agricultural use (Table 3.53).

In 2005, ammonia and nitrate made up 90% of the total tonnage of substances released—to by into water (Table 3.54). Water contaminated with high levels of nitrate cannot be used as drinking water and ammonia is toxic to fish and other aquatic organisms.

3.6.4 Wildlife

Despite the importance of wildlife to Canadians, our activities have significantly reduced certain wildlife populations. Hunting by early European settlers was unregulated and in some cases, excessive. Habitats have been disrupted and fragmented as land has been drained and cleared to make way for agriculture, forestry, urbanization, transportation corridors and industrial development. Habitats have also been polluted, creating conditions under which a number of species can no longer live or reproduce.

As of 2007, 35 animal and plant species in Canada were either extinct or extirpated, while 225 were considered to be endangered and another 141 were classified as threatened (Table 3.56). Table 3.55 lists extinct and extirpated species in Canada, including date of extinction/extirpation and probable cause(s).

Human activity has affected the structure and function of many ecosystems through the introduction of invasive species. Invasive species include animals, microbes and plants that enter new areas when humans carry them across natural barriers, such as bodies of water that normally limit their dispersal. Invasive species can displace native species or alter native habitats in a significant fashion as they become established in an ecosystem.

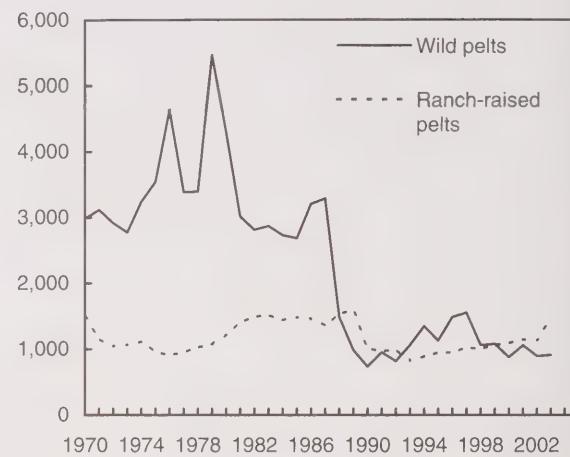
Invasive species in Canada considered to be of highest threat to our ecosystems are presented in Table 3.57. Information on the origin of these species, their invasive range in Canada and major impacts on ecosystems as well as background on when and how they were introduced is also included.

While many prefer to simply view wildlife in a natural setting, hunting remains a popular recreational activity.

Some continue to hunt and trap for their livelihood. At the same time, farming of furbearing animals continues to contribute to the Canadian economy. Table 3.58 shows harvest estimates for selected waterfowl species including Canada geese, American black ducks and mallards. Tables 3.59 and 3.60 and Charts 3.11 and 3.12 show the number and value of wild and farmed pelts harvested.

Chart 3.11
Number of pelts harvested

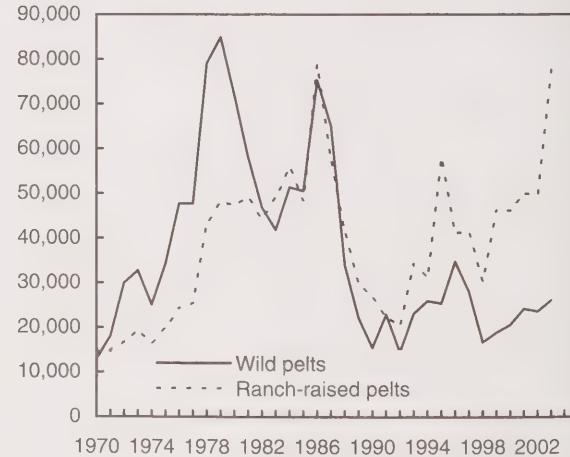
thousands



Source(s): CANSIM table 003-0013.

Chart 3.12
Value of pelts harvested

thousand of dollars



Source(s): CANSIM table 003-0013.

Table 3.1
Total population by province and territory, selected census years

	1901	1911	1921	1931	1941	1951	1961
thousands							
Canada	5,371.3	7,206.6	8,787.8	10,376.7	11,506.7	14,009.4	18,238.3
Newfoundland and Labrador	..	..	..	..	..	361.4	457.9
Prince Edward Island	103.3	93.7	88.6	88.0	95.0	98.4	104.6
Nova Scotia	459.6	492.3	523.8	512.8	578.0	642.6	737.0
New Brunswick	331.1	351.9	387.9	408.2	457.4	515.7	597.9
Quebec	1,648.9	2,005.8	2,360.5	2,874.7	3,331.9	4,055.7	5,259.2
Ontario	2,182.9	2,527.3	2,933.7	3,431.7	3,787.7	4,597.6	6,236.1
Manitoba	255.2	461.4	610.1	700.1	729.7	776.5	921.7
Saskatchewan	91.3	492.4	757.5	921.8	896.0	831.7	925.2
Alberta	73.0	374.3	588.5	731.6	796.2	939.5	1,332.0
British Columbia	178.7	392.5	524.6	694.3	817.8	1,165.2	1,629.1
Yukon Territory	27.2	8.5	4.1	4.2	5.0	9.1	14.6
Northwest Territories	20.1 ¹	6.5 ¹	8.1 ¹	9.3 ¹	12.0 ¹	16.0 ¹	23.0 ¹
Nunavut	..	..	..	..	..	..	..
1971 1981 1991 2001 2006							
Percentage change							
					1901 to 1951	1951 to 2006	
thousands							
Canada	21,962.0	24,820.4	28,031.4	31,021.3	32,649.5	161	133
Newfoundland and Labrador	530.9	574.8	579.5	522.0	509.9	..	41
Prince Edward Island	112.6	123.7	130.3	136.7	138.0	-5	40
Nova Scotia	797.3	854.6	915.1	932.4	935.0	40	46
New Brunswick	642.5	706.3	745.5	749.9	749.2	56	45
Quebec	6,137.3	6,547.7	7,064.6	7,397.0	7,651.0	146	89
Ontario	7,849.0	8,811.3	10,428.1	11,897.6	12,705.3	111	176
Manitoba	998.9	1,036.4	1,109.6	1,151.3	1,178.5	204	52
Saskatchewan	932.0	975.9	1,002.7	1,000.1	987.5	811	19
Alberta	1,665.7	2,294.2	2,592.6	3,056.7	3,370.6	1,187	259
British Columbia	2,240.5	2,823.9	3,373.5	4,078.4	4,320.3	552	271
Yukon Territory	19.0	23.9	28.9	30.1	31.2	-67	243
Northwest Territories	36.4 ¹	47.6 ¹	38.7	40.8	42.4		
Nunavut	..	..	22.2	28.1	30.4	..	..

¹. Includes Nunavut.

Note(s): Figures may not add up to totals due to rounding.

Source(s): CANSIM tables 075-0009, 051-0024 and 051-0001.

Table 3.2
Components of population growth

	Population 1. 2			Natural increase				International migration				
	Population at beginning period (July 1)	Population growth	Growth rate	Births	Deaths	Natural increase	Immigrants	Emigrants	Returning emigrants	Net temporary emigrants	Net non-permanent residents ³	Net international migration
	thousands	percent							thousands			
1972/1973	22,218.5	273.3	1.2	345.8	162.6	183.2	138.5	63.8	36.1	..	8.0	..
1973/1974	22,491.8	316.2	1.4	342.4	166.3	176.2	217.5	83.5	36.7	..	-2.0	..
1974/1975	22,807.9	335.3	1.5	356.0	168.8	187.2	209.3	78.0	37.5	..	8.0	..
1975/1976	23,143.2	306.6	1.3	364.3	166.4	197.8	170.0	66.7	36.4	..	-3.0	..
1976/1977	23,449.8	276.1	1.2	357.8	165.7	192.1	130.9	57.8	32.8	..	-2.0	..
1977/1978	23,725.9	237.4	1.0	359.8	169.0	190.8	101.0	63.3	31.9	..	-3.0	..
1978/1979	23,963.4	238.4	1.0	362.4	165.8	196.6	84.5	62.4	31.5	..	8.0	..
1979/1980	24,201.8	314.3	1.3	367.3	171.5	195.8	143.8	49.9	29.4	..	15.0	..
1980/1981	24,516.1	304.3	1.2	372.1	170.5	201.6	127.2	44.9	27.0	..	13.3	..
1981/1982	24,820.4	297.0	1.2	372.5	172.4	200.1	135.3	54.8	25.7	..	12.3	..
1982/1983	25,117.4	249.5	1.0	373.6	176.5	197.1	101.4	59.2	28.1	..	3.8	..
1983/1984	25,367.0	240.7	0.9	374.5	174.2	200.4	88.6	57.8	26.0	..	5.1	..
1984/1985	25,607.7	235.1	0.9	376.3	179.1	197.2	83.9	55.2	27.1	..	3.7	..
1985/1986	25,842.7	258.4	1.0	375.4	183.4	192.0	88.7	50.6	25.8	..	22.4	..
1986/1987	26,101.2	347.7	1.3	373.0	182.6	190.4	130.9	47.7	16.7	..	58.7	..
1987/1988	26,448.9	346.5	1.3	370.0	189.9	180.1	152.2	41.0	14.3	..	42.2	..
1988/1989	26,795.4	486.4	1.8	384.0	188.4	195.6	177.6	40.4	14.1	..	140.7	..
1989/1990	27,281.8	415.7	1.5	403.3	192.6	210.7	203.4	39.8	13.9	..	28.8	..
1990/1991	27,697.5	333.9	1.2	402.9	192.4	210.5	221.4	43.7	15.2	..	-66.5	..
1991/1992	28,031.4	335.3	1.2	403.1	197.0	206.1	244.3	45.6	15.9	19.7	-42.9	151.9
1992/1993	28,366.7	314.9	1.1	392.2	201.8	190.4	266.9	44.0	15.3	19.7	-71.2	147.2
1993/1994	28,681.7	317.3	1.1	386.2	206.5	179.7	235.4	49.5	16.4	19.7	-22.2	160.3
1994/1995	28,999.0	303.1	1.0	382.0	209.4	172.6	220.7	52.1	18.4	19.7	-14.2	153.2
1995/1996	29,302.1	308.7	1.0	372.5	209.8	162.7	217.5	48.4	19.0	19.7	-0.8	167.5
1996/1997	29,610.8	296.4	1.0	357.3	217.2	140.1	224.9	52.8	19.0	25.6	0.2	165.6
1997/1998	29,907.2	249.9	0.8	345.1	217.7	127.4	194.5	51.8	18.7	25.6	-4.0	131.8
1998/1999	30,157.1	246.8	0.8	338.3	217.6	120.7	173.2	48.0	17.5	25.6	18.3	135.4
1999/2000	30,403.9	285.2	0.9	336.9	217.2	119.7	205.7	48.1	17.7	25.6	25.0	174.8
2000/2001	30,689.0	332.2	1.1	327.1	219.1	108.0	252.5	47.8	17.9	25.6	35.6	232.7
2001/2002	31,021.3	351.3	1.1	328.2	220.5	107.7	256.3	38.9	18.1	25.6	33.8	243.7
2002/2003	31,372.6	303.5	1.0	330.5	223.9	106.6	199.2	36.0	21.3	25.6	37.9	196.9
2003/2004	31,676.1	319.1	1.0	337.8	228.8	108.9	239.1	38.1	22.7	25.6	12.0	210.2
2004/2005	31,995.2	316.9	1.0	339.3	229.4	109.9	244.6	40.7	22.5	25.6	6.1	207.0
2005/2006	32,312.1	337.4	1.0	345.4	230.7	114.7	254.4	41.0	22.5	25.6	12.4	222.7
2006/2007	32,649.5	326.5	1.0	352.8	237.9	114.9	238.1	41.3	22.5	25.6	17.9	211.6
2007/2008	32,976.0	..	..	..	..	..	..	..	..	..	..	..

- Postcensal estimates are based on the latest census results adjusted for net census undercoverage and for the estimated population growth that occurred since that census. Intercensal estimates are based on postcensal estimates and data adjusted for net census undercoverage of the censuses preceding and following the considered year.
- Estimates are revised intercensal from 1971 to 1995, final intercensal from 1996 to 2000, final postcensal from 2001 to 2004, updated postcensal for 2005 and 2006 and preliminary postcensal for 2007.
- The five following groups are referred to as NPRs: (1) persons residing in Canada claiming refugee status; (2) persons residing in Canada who hold a study permit; (3) persons residing in Canada who hold a work permit; (4) persons residing in Canada who hold a Minister's permit; (5) all non-Canadian born dependants of persons claiming refugee status, or of persons holding study permits, work permits or Minister's permits and living in Canada.

Note(s): Data are presented from July 1 to June 30. Population growth figures do not equal the sum of the natural increase and international migration. It is necessary to add the residual deviation to these data.

Source(s): CANSIM tables 051-0001 and 051-0004.

Table 3.3
Population by ecozone

Area	Population				Density	
	1981	2001	2006	Change 1981 to 2006	1981	2006
square kilometres	persons				persons per 100 square kilometres	
Canada	8,806,839	24,343,181	30,007,094	31,612,897	7,269,716	276.4
Arctic Cordillera	234,708	821	1,304	1,293	472	0.3
Northern Arctic	1,371,340	11,872	20,451	22,859	10,987	0.9
Southern Arctic	702,542	8,137	14,470	15,893	7,756	1.2
Baiga Plains	569,363	18,358	20,726	22,225	3,867	3.2
Baiga Shield	1,122,504	30,859	38,116	41,682	10,823	2.7
Boreal Shield	1,640,949	2,731,344	2,821,808	2,886,412	155,068	166.4
Atlantic Maritime	192,017	2,428,735	2,537,685	2,554,089	125,354	1264.9
Mixed Wood Plains	107,017	12,187,952	15,631,830	16,611,643	4,423,691	11388.8
Boreal Plains	668,664	673,775	771,205	812,017	138,242	100.8
Prairies	443,159	3,499,494	4,222,569	4,514,106	1,014,612	789.7
Baiga Cordillera	264,213	563	370	411	-152	0.2
Boreal Cordillera	459,864	26,507	30,690	32,244	5,737	5.8
Pacific Maritime	196,200	2,014,790	3,027,206	3,215,775	1,200,985	1026.9
Montane Cordillera	474,753	701,014	859,134	873,498	172,484	147.7
Hudson Plains	359,546	8,960	9,530	8,750	-210	2.5
						2.4

Note(s): The area figures are for land area only and are calculated by taking the total ecozone area and subtracting the surface water area in the ecozone derived from the 1-km water fraction digital coverage. The total area of Canada excluding the Great Lakes is 9,886,215 km². Including the Canadian portion of the Great Lakes the total area of Canada is 9,976,182 km². The population figures presented here are the census counts and are not adjusted for net undercoverage and non-permanent residents.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Spatial Environmental Information System and Censuses of Population, 1981, 2001 and 2006. Agriculture and Agri-Food Canada, no date, National Land and Water Information Service, <http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html> (accessed April 7, 2008). Natural Resources Canada, no date, National Scale Frameworks Hydrology - Drainage Areas, Canada, http://geogratis.gc.ca/download/frameworkdata/drainage_areas/ (accessed April 7, 2008).

Table 5
Population by provincial and territorial ecozone

	Area		Population						Density			
	1981 to 1999	1999 to 2006	1981	1991	2001	2006	Change 1981 to 2006	1981	1991	2001	2006	Change 1981 to 2006
	square kilometres		persons						persons per square kilometre			
Canada	8,806,839	8,806,839	24,343,181	27,296,859	30,007,094	31,612,897	7,269,716	2.764	3.099	3.407	3.590	29.9
Newfoundland and Labrador												
Arctic Cordillera	17,318	17,318	0	0	0	0	0	0.000	0.000	0.000	0.000	0.0
Boreal Shield	139,813	139,813	563,063	563,897	508,197	500,806	-62,257	4.027	4.033	3.635	3.582	-11.1
Taiga Shield	194,228	194,228	4,618	4,577	4,733	4,663	45	0.024	0.024	0.024	0.024	0.0
Total	351,359	351,359	567,681	568,474	512,930	505,469	-62,212	1.616	1.618	1.460	1.439	-11.0
Prince Edward Island												
Atlantic Maritime	5,402	5,402	122,506	129,765	135,294	135,851	13,345	22.679	24.023	25.047	25.148	10.9
Total	5,402	5,402	122,506	129,765	135,294	135,851	13,345	22.679	24.023	25.047	25.148	10.9
Nova Scotia												
Atlantic Maritime	50,633	50,633	847,442	899,942	908,007	913,462	66,020	16.737	17.774	17.933	18.041	7.8
Total	50,633	50,633	847,442	899,942	908,007	913,462	66,020	16.737	17.774	17.933	18.041	7.8
New Brunswick												
Atlantic Maritime	70,602	70,602	696,403	723,900	729,498	729,997	33,594	9.864	10.253	10.333	10.340	4.8
Total	70,602	70,602	696,403	723,900	729,498	729,997	33,594	9.864	10.253	10.333	10.340	4.8
Quebec												
Arctic Cordillera	12,360	12,360	0	0	0	0	0	0.000	0.000	0.000	0.000	0.0
Atlantic Maritime	65,380	65,380	762,384	758,879	764,886	774,779	12,395	11,661	11,607	11,699	11,850	1.6
Boreal Shield	573,556	573,556	1,159,520	1,227,015	1,292,746	1,351,404	191,884	2.022	2.139	2.254	2.356	16.5
Hudson Plains	34,724	34,724	1,342	1,788	2,312	2,514	1,172	0.039	0.051	0.067	0.072	85.6
Mixed Wood Plains	27,220	27,220	4,501,391	4,894,723	5,160,906	5,398,949	897,558	165,373	179,823	189,602	198,345	19.9
Northern Arctic	33,599	33,599	932	1,461	1,842	2,097	1,165	0.028	0.043	0.055	0.062	122.9
Southern Arctic	123,968	123,968	2,156	3,257	4,017	4,630	2,474	0.017	0.026	0.032	0.037	119.7
Taiga Shield	437,194	437,194	10,678	8,840	10,770	11,758	1,080	0.024	0.020	0.025	0.027	12.1
Total	1,308,002	1,308,002	6,438,403	6,895,963	7,237,479	7,546,131	1,107,728	4.922	5.272	5.533	5.769	17.2
Ontario												
Boreal Shield	559,603	559,603	933,099	952,438	933,908	943,313	10,214	1.667	1.702	1.669	1.686	1.1
Hudson Plains	254,963	254,963	5,447	5,789	5,214	4,275	-1,172	0.021	0.023	0.020	0.017	-20.2
Mixed Wood Plains	79,798	79,798	7,686,561	9,126,658	10,470,924	11,212,694	3,526,133	96,326	114,372	131,218	140,513	45.9
Total	894,364	894,364	8,625,107	10,084,885	11,410,046	12,160,282	3,535,175	9.644	11.276	12.758	13.597	41.0
Manitoba												
Boreal Plains	83,667	83,667	104,579	110,298	116,672	120,760	16,181	1.250	1.318	1.394	1.443	15.5
Boreal Shield	216,334	216,334	65,707	68,052	72,277	75,945	10,238	0.304	0.315	0.334	0.351	15.5
Hudson Plains	66,685	66,685	2,171	2,361	2,004	1,961	-210	0.033	0.035	0.030	0.029	-10.9
Prairies	64,234	64,234	852,832	910,069	927,172	948,339	95,507	13,277	14,168	14,434	14,764	11.2
Southern Arctic	1,142	1,142	0	0	0	0	0	0.000	0.000	0.000	0.000	0.0
Taiga Shield	109,048	109,048	952	1,162	1,458	1,396	444	0.009	0.011	0.013	0.013	42.2
Total	541,110	541,110	1,026,241	1,091,942	1,119,583	1,148,401	122,160	1.897	2.018	2.069	2.122	11.9
Saskatchewan												
Boreal Plains	163,274	163,274	161,945	158,821	160,484	158,021	-3,924	0.992	0.973	0.983	0.968	-2.4
Boreal Shield	147,484	147,484	9,955	12,086	14,680	14,939	4,984	0.067	0.082	0.100	0.101	51.2
Prairies	229,248	229,248	792,946	816,283	801,806	793,332	386	3,459	3,561	3,498	3,461	0.0
Taiga Shield	37,460	37,460	3,467	1,738	1,963	1,865	-1,602	0.093	0.046	0.052	0.050	-46.5
Total	577,467	577,467	968,313	988,928	978,933	968,157	-156	1.677	1.713	1.695	1.677	0.0
Alberta												
Boreal Plains	367,431	367,431	354,030	387,592	438,155	474,416	120,386	0.964	1.055	1.192	1.291	33.9
Boreal Shield	4,159	4,159	0	4	0	5	5	0.000	0.001	0.000	0.001	100.0
Montane Cordillera	46,336	46,336	27,961	31,481	39,813	40,120	12,159	0.603	0.679	0.859	0.866	43.6
Prairies	149,676	149,676	1,853,716	2,123,916	2,493,591	2,772,435	918,719	12,385	14,190	16,660	18,523	49.6
Taiga Plains	60,663	60,663	2,017	2,560	2,938	3,100	1,083	0.033	0.042	0.048	0.051	54.9
Taiga Shield	7,932	7,932	0	0	310	274	274	0.000	0.000	0.039	0.035	100.0
Total	636,199	636,199	2,237,724	2,545,553	2,974,807	3,290,350	1,052,626	3.517	4.001	4.676	5.172	47.1
British Columbia												
Boreal Cordillera	188,728	188,728	3,598	3,351	2,396	2,283	-1,315	0.019	0.018	0.013	0.012	-36.3
Boreal Plains	39,073	39,073	48,582	49,126	53,174	55,972	7,390	1.243	1.257	1.361	1.432	15.2
Montane Cordillera	428,417	428,417	673,053	720,713	819,321	833,378	160,325	1.571	1.682	1.912	1.945	23.8
Pacific Maritime	192,107	192,107	2,014,790	2,503,960	3,027,206	3,215,775	1,200,985	10,488	13,034	15,758	16,739	59.6
Taiga Plains	66,853	66,853	4,444	4,911	5,641	6,079	1,635	0.066	0.073	0.084	0.091	37.8
Total	915,178	915,178	2,744,467	3,282,061	3,907,738	4,113,487	1,369,020	2.999	3.586	4.270	4.495	49.9
Yukon Territory												
Boreal Cordillera	266,546	266,546	22,909	27,488	28,294	29,961	7,052	0.086	0.103	0.106	0.112	30.7
Pacific Maritime	4,093	4,093	0	0	0	0	0	0.000	0.000	0.000	0.000	0.0
Southern Arctic	4,496	4,496	1	0	0	0	-1	0.000	0.000	0.000	0.000	0.0
Taiga Cordillera	180,170	180,170	243	309	370	411	168	0.001	0.002	0.002	0.002	128.1

See footnotes at the end of the table.

Table 3.4 – continued

Population by provincial and territorial ecozone

	Area		Population						Density				
	1981 to 1999	1999 to 2006	1981	1991	2001	2006	Change 1981 to 2006	1981	1991	2001	2006	Change 1981 to 2006	
	square kilometres		persons						persons per square kilometre				percent
Taiga Plains	18,110	18,110	0	0	10	0	0	0.000	0.000	0.001	0.000	0.0	
Total	473,415	473,415	23,153	27,797	28,674	30,372	7,219	0.049	0.059	0.061	0.064	30.9	
Northwest Territories¹													
Arctic Cordillera	205,053	...	821	1,047	...	0	-821	0.004	0.005	...	...	...
Boreal Cordillera	4,589	4,589	0	0	0	0	0	0.000	0.000	0.000	0.000	0.0	
Boreal Plains	15,218	15,218	4,639	3,008	2,720	2,848	-1,791	0.305	0.198	0.179	0.187	-38.6	
Hudson Plains	3,174	...	0	0	...	0	0	0.000	0.000	...	0.000	0.0	
Northern Arctic	1,337,719	198,761	10,940	14,867	512	520	-10,420	0.008	0.075	0.003	0.003	-67.3	
Southern Arctic	572,936	158,124	5,980	7,057	3,109	3,324	-2,656	0.010	0.045	0.020	0.021	110.2	
Taiga Cordillera	84,043	84,043	320	0	0	0	-320	0.004	0.000	0.000	0.000	-100.0	
Taiga Plains	423,737	423,737	11,897	13,958	12,137	13,046	1,149	0.028	0.033	0.029	0.031	10.0	
Taiga Shield	336,641	257,638	11,144	17,712	18,882	21,726	10,582	0.033	0.069	0.073	0.084	155.5	
Total	2,983,143	1,142,110	45,741	57,649	37,360	41,464	-4,277	0.015	0.050	0.033	0.036	142.0	
Nunavut¹													
Arctic Cordillera	...	205,053	...	...	1,304	1,293	...	...	...	0.006	0.006	...
Hudson Plains	...	3,174	...	...	0	0	...	...	...	0.000	0.000	...
Northern Arctic	...	1,138,957	...	...	18,097	20,242	...	...	...	0.016	0.018	...
Southern Arctic	...	414,811	...	...	7,344	7,939	...	...	...	0.018	0.019	...
Taiga Shield	...	79,003	...	...	0	0	...	...	...	0.000	0.000	...
Total	...	1,841,032	...	...	26,745	29,474	...	...	...	0.015	0.016	...

1. As Nunavut was created on April 1, 1999, population data is not available for 1981 and 1991. Population for 1981 and 1991 for Nunavut is included in the Northwest Territories data.

Note(s): The area figures are for land area only and are calculated by taking the total ecozone area and subtracting the surface water area in the ecozone derived from the 1-km water fraction digital coverage. The total area of Canada excluding the Great Lakes is 9,886,215 km². Including the Great Lakes the total area of Canada is 9,976,182 km². The population figures presented here are the census counts and are not adjusted for net undercoverage and non-permanent residents.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Spatial Environmental Information System and Censuses of Population, 1981, 1991, 2001 and 2006. Agriculture and Agri-Food Canada, no date, National Land and Water Information Service, <http://sis.agr.gc.ca/cansis/nsdb/ecostrat/hierarchy.html> (accessed April 7, 2008). Natural Resources Canada, no date, National Scale Frameworks Hydrology - Drainage Areas, Canada, http://geografis.cgsi.gc.ca/download/frameworkdata/drainage_areas/ (accessed April 7, 2008).

Table 3.5
Population characteristics by major river basin¹

Drainage area code	Total population		Population as a share of total	Population change	Population density in 2006		Mean annual streamflow per capita	
	1971	2006			2006	1971 to 2006		
thousands of cubic metres per person								
code	persons		percent		persons per square kilometre		person	
Canada	...	21,568,311	31,612,897	100.00	46.6	3.2	26.9	
Pacific Coastal	1	916,210	1,437,391	4.55	56.9	4.3	95.6	
Fraser - Lower Mainland	2	967,851	2,144,661	6.78	121.6	9.2	237.9	
Okanagan - Similkameen	3	120,553	305,011	0.96	153.0	19.5	469.3	
Columbia	4	131,462	156,987	0.50	19.4	1.8	63.2	
Yukon	5	17,204	28,706	0.09	66.9	0.1	3.1	
Peace - Athabasca	6	206,564	375,036	1.19	81.6	0.8	22.4	
Lower Mackenzie	7	34,182	53,973	0.17	57.9	0.0	0.3	
Arctic Coast - Islands	8	7,690	18,358	0.06	138.7	0.0	0.1	
Missouri	9	14,349	8,869	0.03	-38.2	0.3	7.9	
North Saskatchewan	10	844,730	1,416,072	4.48	67.6	9.4	195.4	
South Saskatchewan	11	948,446	1,953,874	6.18	106.0	11.0	313.0	
Assiniboine - Red	12	1,250,804	1,383,937	4.38	10.6	7.3	152.1	
Winnipeg	13	84,685	84,757	0.27	0.1	0.8	4.1	
Lower Saskatchewan - Nelson	14	237,276	215,255	0.68	-9.3	0.6	3.2	
Churchill	15	61,711	88,638	0.28	43.6	0.3	1.7	
Keewatin - Southern Baffin Island	16	6,271	13,261	0.04	111.5	0.0	0.1	
Northern Ontario	17	149,112	137,806	0.44	-7.6	0.2	1372	
Northern Quebec	18	87,805	105,401	0.33	20.0	0.1	0.7	
Great Lakes - St. Lawrence	19	12,759,943	18,772,580	59.38	47.1	32.2	139.1	
North Shore - Gaspé	20	503,796	508,030	1.61	0.8	1.4	13.6	
Saint John - St. Croix	21	365,294	402,583	1.27	10.2	9.6	223.7	
Maritime Coastal	22	1,329,135	1,494,979	4.73	12.5	12.2	222.2	
Newfoundland - Labrador	23	523,238	506,732	1.60	-3.2	1.3	9.1	

1. These major river basins and associated flow measures are adapted from Laycock (1987) (see full reference below). Some of these river basin aggregates have more than one outflow.

2. Area includes the Canadian portion of the Great Lakes.

3. Water area figures are calculated from the Canada-wide 1 km² water fraction derived from National Topographic Database maps.

Source(s): Environment Canada, 2003, Canadian Climate Normals, 1971 to 2000, Meteorological Service of Canada,

http://climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html (accessed February 23, 2005). Pearse, P.H., F. Bertrand and J.W. MacLaren, 1985,

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Table 3.6-1

Total population by major drainage and sub-drainage area — Maritime Provinces

	Drainage area code	1981	1986	1991	1996	2001	2006
number							
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Maritime Provinces	[01]	1,806,205	1,848,245	1,883,845	1,911,685	1,893,695	1,897,915
Saint John and Southern Bay of Fundy, N.B.	[01A]	385,680	393,945	398,480	408,885	403,755	403,430
Gulf of St. Lawrence and Northern Bay of Fundy, N.B.	[01B]	450,040	454,330	455,665	458,955	446,645	445,020
Prince Edward Island	[01C]	122,510	126,645	129,765	134,560	135,295	135,870
Bay of Fundy and Gulf of St. Lawrence, N.S.	[01D]	291,055	305,415	315,810	321,270	317,940	319,885
Southeastern Atlantic Ocean, N.S.	[01E]	386,840	401,795	422,445	429,745	441,655	451,390
Cape Breton Island	[01F]	170,085	166,115	161,685	158,275	148,410	142,320

Source(s): CANSIM table 153-0036.

Table 3.6-2

Total population by major drainage and sub-drainage area — St. Lawrence

	Drainage area code	1981	1986	1991	1996	2001	2006
number							
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
St. Lawrence	[02]	15,137,905	15,727,225	17,073,065	17,963,690	18,704,560	19,763,560
Northwestern Lake Superior	[02A]	133,445	134,360	136,790	137,515	132,490	134,185
Northeastern Lake Superior	[02B]	55,595	50,145	51,075	49,510	46,625	42,530
Northern Lake Huron	[02C]	263,665	260,525	266,290	267,435	253,190	256,845
Wanapitei and French, Ont.	[02D]	91,670	87,530	91,315	91,675	89,015	89,390
Eastern Georgian Bay	[02E]	410,135	440,775	540,300	610,395	679,535	761,645
Eastern Lake Huron	[02F]	263,420	275,645	302,160	309,535	310,990	310,620
Northern Lake Erie	[02G]	1,649,120	1,690,085	1,838,285	1,933,060	2,028,510	2,142,595
Lake Ontario and Niagara Peninsula	[02H]	4,549,385	4,879,010	5,463,720	5,882,975	6,356,940	6,861,310
Upper Ottawa	[02J]	112,510	114,270	120,075	120,200	112,595	111,740
Central Ottawa	[02K]	343,685	356,280	383,730	412,425	429,430	448,115
Lower Ottawa	[02L]	857,915	932,310	1,044,135	1,129,250	1,190,950	1,268,965
Upper St. Lawrence	[02M]	233,990	246,585	260,335	273,790	270,745	280,025
Saint-Maurice	[02N]	131,615	135,045	126,960	128,740	126,420	127,555
Central St. Lawrence	[02O]	3,895,360	3,971,215	4,253,605	4,407,750	4,516,340	4,748,230
Lower St. Lawrence	[02P]	1,052,255	1,068,255	1,118,665	1,149,035	1,154,435	1,188,920
Northern Gaspé Peninsula	[02Q]	140,060	139,320	132,855	132,995	131,525	129,605
Saguenay	[02R]	287,275	286,690	287,215	287,765	279,825	272,800
Betsiamites, coast	[02S]	16,200	15,505	15,155	15,160	15,385	14,675
Manicouagan and aux Outardes	[02T]	23,655	20,155	20,240	20,495	18,170	19,195
Moisie and St. Lawrence Estuary	[02U]	61,195	53,820	53,055	52,840	49,250	48,850
Gulf of St. Lawrence, Romaine	[02V]	2,065	2,030	2,145	2,195	1,560	1,485
Gulf of St. Lawrence, Natashquan	[02W]	20,755	21,380	19,970	19,685	19,880	19,145
Petit Mécatina and Strait of Belle Isle	[02X]	6,565	6,650	6,905	6,670	5,705	6,145
Northern Newfoundland	[02Y]	217,670	214,330	208,475	198,690	178,700	171,240
Southern Newfoundland	[02Z]	318,690	325,285	329,625	323,905	306,360	307,750

Source(s): CANSIM table 153-0036.

Table 3.6-3

Total population by major drainage and sub-drainage area — Northern Quebec and Labrador

Drainage area code	1981	1986	1991	1996	2001	2006
number						
Canada	24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Northern Quebec and Labrador	[03]	78,220	70,670	72,590	74,460	73,160
Nottaway, coast	[03A]	32,305	29,400	27,005	26,985	25,180
Broadback and Rupert	[03B]	2,955	3,525	3,380	4,375	4,865
Eastmain	[03C]	330	360	440	525	615
La Grande, coast	[03D]	5,410	3,540	4,210	4,725	4,970
Grande rivière de la Baleine, coast	[03E]	1,065	1,050	1,115	1,380	1,330
Eastern Hudson Bay	[03F]	0	55	285	320	350
Northeastern Hudson Bay	[03G]	1,665	1,985	2,510	2,765	3,055
Western Ungava Bay	[03H]	1,320	1,705	2,075	2,335	2,645
Aux Feuilles, coast	[03J]	175	245	285	355	385
Koksoak	[03K]	810	1,070	1,405	1,730	1,930
Caniapiscau	[03L]	3,170	1,075	1,140	1,215	1,255
Eastern Ungava Bay	[03M]	145	380	525	650	710
Northern Labrador	[03N]	2,175	2,445	2,655	2,560	2,895
Churchill, N.L.	[03O]	19,710	16,185	17,145	16,175	14,165
Central Labrador	[03P]	4,310	4,785	5,440	5,520	6,095
Southern Labrador	[03Q]	2,665	2,875	2,965	2,875	2,715

Source(s): CANSIM table 153-0036.

Table 3.6-3

Total population by major drainage and sub-drainage area — Southwestern Hudson Bay

Drainage area code	1981	1986	1991	1996	2001	2006
number						
Canada	24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Southwestern Hudson Bay	[04]	207,340	199,745	207,410	210,250	200,275
Hayes, Man.	[04A]	5,145	7,650	7,365	9,440	10,445
Southwestern Hudson Bay	[04B]	0	0	0	0	0
Severn	[04C]	4,290	575	3,590	4,625	5,760
Winisk, coast	[04D]	1,575	1,055	1,945	2,295	2,615
Ekwan, coast	[04E]	0	0	0	0	0
Attawapiskat, coast	[04F]	1,400	490	1,945	2,040	1,965
Upper Albany	[04G]	2,775	1,050	1,550	1,545	2,260
Lower Albany, coast	[04H]	1,200	0	1,195	1,605	445
Kenogami	[04J]	11,040	10,485	9,060	8,805	8,105
Moose, Ont.	[04K]	2,975	1,935	2,855	4,070	2,885
Missinaibi and Mattagami	[04L]	71,360	69,265	68,265	67,170	62,010
Abitibi	[04M]	51,130	50,430	50,005	48,785	46,375
Harricanaw, coast	[04N]	54,450	56,815	59,615	59,880	57,415

Source(s): CANSIM table 153-0036.

Table 3.6-5

Total population by major drainage and sub-drainage area — Nelson River

	Drainage area code	1981	1986	1991	1996	2001	2006
		number					
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Nelson River	[05]	3,975,415	4,163,310	4,347,520	4,497,255	4,746,290	5,053,865
Upper South Saskatchewan	[05A]	193,860	201,045	209,695	221,130	231,665	249,210
Bow	[05B]	670,160	716,255	805,825	883,470	1,029,515	1,166,785
Red Deer	[05C]	167,620	178,675	188,285	202,625	220,550	243,780
Upper North Saskatchewan	[05D]	295,410	284,880	303,690	312,845	342,365	385,930
Central North Saskatchewan	[05E]	576,450	638,380	683,145	697,835	747,370	811,145
Battle	[05F]	107,650	105,455	106,290	111,590	118,105	122,250
Lower North Saskatchewan	[05G]	102,505	105,895	102,620	101,530	100,240	96,565
Lower South Saskatchewan	[05H]	248,015	274,140	277,460	284,360	289,255	295,920
Qu'Appelle	[05J]	323,500	333,890	330,410	326,810	318,850	313,530
Saskatchewan	[05K]	71,065	68,755	65,215	65,160	63,130	61,915
Lake Winnipegosis and Lake Manitoba	[05L]	98,160	94,195	90,590	89,915	91,860	82,900
Assiniboine	[05M]	374,905	365,480	353,115	349,745	337,010	336,190
Souris	[05N]	81,070	80,400	74,510	73,520	69,765	65,520
Red	[05O]	526,560	575,680	611,715	625,545	638,805	668,130
Winnipeg	[05P]	53,830	54,150	56,165	57,430	54,745	56,615
English	[05Q]	28,900	29,365	28,305	29,380	28,455	28,005
Eastern Lake Winnipeg	[05R]	5,405	5,275	5,350	5,750	5,175	7,840
Western Lake Winnipeg	[05S]	24,660	22,815	25,455	27,980	30,730	31,220
Grass and Burntwood	[05T]	18,235	19,810	19,830	19,450	17,975	18,325
Nelson	[05U]	7,460	8,770	9,860	11,185	10,710	12,090

Source(s): CANSIM table 153-0036.

Table 3.6-6
Total population by major drainage and sub-drainage area — Western and Northern Hudson Bay

	Drainage area code	1981	1986	1991	1996	2001	2006
		number					
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Western and Northern Hudson Bay	[06]	76,300	82,725	85,540	95,660	98,540	103,730
Beaver, Alta. and Sask.	[06A]	46,355	50,875	52,490	57,095	58,215	61,605
Upper Churchill, Manitoba	[06B]	6,795	6,495	7,075	7,830	8,185	8,605
Central Churchill, upper, Manitoba	[06C]	6,570	7,340	8,015	9,610	10,430	10,865
Reindeer	[06D]	1,450	2,340	2,490	3,135	3,160	3,595
Central Churchill, lower, Manitoba	[06E]	6,485	6,165	4,785	5,760	5,560	4,870
Lower Churchill, Manitoba	[06F]	1,440	1,220	1,175	1,085	960	925
Seal, coast	[06G]	240	215	235	340	315	330
Western Hudson Bay, Southern	[06H]	0	0	0	0	0	0
Thelon	[06J]	0	0	0	0	0	0
Dubawnt	[06K]	0	0	0	0	0	0
Kazan	[06L]	0	0	0	0	0	0
Chesterfield Inlet	[06M]	955	1,005	1,190	1,390	1,505	1,730
Western Hudson Bay, central	[06N]	2,570	3,070	3,585	4,260	4,730	5,100
Western Hudson Bay, northern	[06O]	0	0	0	0	0	0
Hudson Bay, Southampton Island	[06P]	810	895	1,100	1,300	1,390	1,515
Foxe Basin, Southampton Island	[06Q]	0	0	0	0	0	0
Foxe Basin, Melville Peninsula	[06R]	1,445	1,725	1,955	2,280	2,505	2,945
Foxe Basin, Baffin Island	[06S]	75	110	45	0	0	0
Hudson Strait, Baffin and Southampton Islands	[06T]	1,085	1,245	1,405	1,565	1,585	1,645

Source(s): CANSIM table 153-0036.

Table 3.6-7

Total population by major drainage and sub-drainage area — Great Slave Lake

	Drainage area code	1981	1986	1991	1996	2001	2006
number							
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Great Slave Lake	[07]	319,365	334,860	342,895	365,465	378,200	409,235
Upper Athabasca	[07A]	34,185	35,690	37,475	40,960	40,835	42,035
Central Athabasca, upper	[07B]	50,445	52,770	53,530	58,085	57,035	57,925
Central Athabasca, lower	[07C]	32,630	30,520	27,015	26,960	38,450	36,060
Lower Athabasca	[07D]	9,085	15,940	18,120	17,750	15,430	26,925
Williston Lake	[07E]	7,440	6,965	7,460	7,705	6,225	4,880
Upper Peace	[07F]	71,255	73,515	74,705	78,060	74,465	77,710
Smoky	[07G]	61,190	62,590	65,580	71,490	78,705	91,060
Central Peace, upper	[07H]	15,180	14,505	12,555	13,495	14,795	15,170
Central Peace, lower	[07J]	10,285	13,950	14,855	15,485	19,290	21,560
Lower Peace	[07K]	825	1,090	1,230	1,660	1,620	425
Fond-du-Lac	[07L]	855	1,665	1,700	2,035	1,945	2,205
Lake Athabasca, shores	[07M]	4,230	1,240	1,250	1,290	1,295	1,150
Slave	[07N]	2,330	2,485	2,510	2,470	2,205	2,375
Hay	[07O]	5,300	5,435	6,305	7,380	5,845	6,355
Southern Great Slave Lake	[07P]	2,345	2,185	720	640	805	1,260
Great Slave Lake, east arm, south shore	[07Q]	255	270	290	305	245	315
Lockhart	[07R]	0	0	0	0	0	0
Northeastern Great Slave Lake	[07S]	10,855	13,225	17,170	19,265	18,195	21,305
Marian	[07T]	265	345	390	420	455	465
Western Great Slave Lake	[07U]	410	470	0	0	355	55

Source(s): CANSIM table 153-0036.

Total population by major drainage and sub-drainage area — Pacific

	Drainage area code	1981	1986	1991	1996	2001	2006
number							
Canada		24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Pacific	[08]	2,680,660	2,818,275	3,215,895	3,655,150	3,840,750	4,043,585
Alsek	[08A]	365	520	650	765	560	610
Northern coastal waters, B.C.	[08B]	0	0	0	0	0	0
Stikine, coast	[08C]	615	685	875	885	915	1,110
Nass, coast	[08D]	3,625	2,670	2,955	2,985	2,590	2,460
Skeena, coast	[08E]	59,260	57,095	60,690	64,625	60,850	56,420
Central coastal waters, B.C.	[08F]	18,245	16,330	17,225	17,390	16,285	14,825
Southern coastal waters, B.C.	[08G]	473,825	491,685	531,145	587,815	625,205	652,660
Vancouver Island	[08H]	496,695	517,380	590,845	655,925	665,695	705,820
Nechako	[08J]	59,570	59,480	59,875	67,415	63,715	61,025
Upper Fraser	[08K]	68,555	69,435	70,240	75,025	74,650	72,015
Thompson	[08L]	143,160	137,485	149,305	172,315	171,985	178,935
Lower Fraser	[08M]	1,008,555	1,118,750	1,347,655	1,570,510	1,708,120	1,830,480
Columbia	[08N]	341,575	341,290	378,995	433,780	445,045	461,620
Queen Charlotte Islands	[08O]	5,620	5,480	5,320	5,590	4,940	4,815
Skagit	[08P]	995	0	85	110	210	790

Source(s): CANSIM table 153-0036.

Table 3.6-9

Total population by major drainage and sub-drainage area — Yukon River

Drainage area code	1981	1986	1991	1996	2001	2006
number						
Canada	24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Yukon River	[09]	21,945	22,200	26,285	28,730	27,230
Headwaters Yukon	[09A]	17,305	18,475	21,945	23,725	23,530
Pelly	[09B]	2,150	990	1,770	1,870	1,025
Upper Yukon	[09C]	390	230	290	295	245
Stewart	[09D]	935	895	540	555	575
Central Yukon	[09E]	915	1,375	1,490	2,005	1,555
Porcupine	[09F]	240	235	255	280	305
Tanana	[09H]	0	0	0	0	0
Copper	[09M]	0	0	0	0	0

Source(s): CANSIM table 153-0036.

Table 3.6-10

Total population by major drainage and sub-drainage area — Arctic

Drainage area code	1981	1986	1991	1996	2001	2006
number						
Canada	24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Arctic	[10]	26,950	29,925	31,365	34,515	34,300
Upper Liard	[10A]	2,935	2,945	2,765	2,320	1,775
Central Liard	[10B]	0	0	135	105	145
Fort Nelson	[10C]	4,590	4,810	4,660	5,495	5,635
Central Liard and Petitot	[10D]	0	0	0	0	0
Lower Liard	[10E]	840	1,035	575	585	1,315
Upper Mackenzie, Mills Lake	[10F]	735	710	765	865	875
Upper Mackenzie, Camsell Bend	[10G]	980	990	1,185	1,280	480
Central Mackenzie, Blackwater Lake	[10H]	440	510	545	615	640
Great Bear	[10J]	820	720	805	875	815
Central Mackenzie, The Ramparts	[10K]	425	630	645	790	665
Lower Mackenzie	[10L]	3,730	4,055	3,955	4,190	3,635
Peel and Southwestern Beaufort Sea	[10M]	1,355	1,525	1,565	1,645	1,465
Southern Beaufort Sea	[10N]	825	980	1,025	945	1,035
Amundsen Gulf	[10O]	620	230	260	1,475	1,490
Coppermine	[10P]	375	895	0	0	0
Coronation Gulf and Queen Maud Gulf	[10Q]	90	80	1,130	65	0
Back	[10R]	0	0	0	0	0
Gulf of Boothia	[10S]	690	790	985	1,145	1,325
Southern Arctic Islands	[10T]	1,835	2,125	2,490	2,785	2,780
Baffin Island, Arctic drainage	[10U]	5,330	6,465	7,545	8,760	9,755
Northern Arctic Islands	[10V]	310	430	305	525	450

Source(s): CANSIM table 153-0036.

Table 3.6-11
Total population by major drainage and sub-drainage area — Mississippi River

Drainage area code	1981	1986	1991	1996	2001	2006
number						
Canada	24,343,181	25,309,300	27,296,859	28,846,761	30,007,094	31,612,895
Mississippi River	[11]	12,875	12,150	10,445	9,905	10,095
Missouri	[11A]	12,875	12,150	10,445	9,905	10,095
Mississippi River	7,525					

Source(s): CANSIM table 153-0036.

Gross domestic product by industry

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
millions of chained 2002 dollars										
All industries	922,584	974,405	1,026,242	1,040,943	1,068,765	1,091,378	1,126,802	1,160,024	1,193,905	1,224,083
Goods-producing industries	307,025	325,467	347,304	339,779	346,175	350,817	361,439	371,208	375,489	378,450
Service-producing industries	615,070	648,465	678,385	701,115	722,590	740,591	765,423	788,924	818,862	846,424
Agriculture, forestry, fishing and hunting	24,471	26,193	26,268	24,674	23,293	25,478	27,685	28,437	27,847	26,886
Mining and oil and gas extraction	49,991	50,000	51,519	51,236	53,488	54,979	55,849	56,044	57,174	58,309
Utilities	28,554	28,982	29,050	27,384	28,883	29,057	29,131	30,550	30,128	31,167
Construction	46,928	49,053	51,757	55,542	57,775	59,871	63,592	68,527	74,087	77,228
Manufacturing	158,819	171,923	188,925	181,084	182,736	181,349	185,504	188,478	186,631	184,668
Wholesale trade	46,221	49,396	52,519	53,438	55,226	57,767	60,283	63,879	68,383	71,346
Retail trade	47,210	49,437	52,579	55,234	58,483	60,515	62,870	65,132	69,015	72,880
Transportation and warehousing	43,905	46,603	48,921	50,176	50,066	50,270	51,960	53,802	55,501	56,405
Information and cultural industries	28,255	31,617	34,007	36,498	38,229	38,631	40,232	41,848	43,147	44,230
Finance, insurance, real estate, rental and leasing and management of companies and enterprises	173,796	181,851	189,181	196,769	202,959	207,544	215,098	221,951	230,362	239,956
Professional, scientific and technical services	38,056	41,845	46,307	47,453	48,481	50,797	52,349	53,793	55,377	57,290
Administrative and support, waste management and remediation services	18,771	20,934	21,809	22,820	24,853	25,722	27,345	28,756	30,524	31,696
Educational services	49,000	50,162	50,394	50,675	51,593	52,566	53,807	55,008	56,221	57,606
Health care and social assistance	61,765	63,754	65,968	67,198	68,142	70,324	71,736	72,784	74,780	76,777
Arts, entertainment and recreation	8,928	9,333	9,718	10,142	10,398	10,365	10,848	10,940	11,410	11,725
Accommodation and food services	22,931	23,804	24,544	24,950	25,408	24,881	25,721	26,418	27,365	27,843
Other services (except public administration)	21,886	23,335	24,627	26,101	27,230	27,894	28,825	29,346	30,072	30,890
Public administration	54,909	56,674	57,968	59,705	61,523	63,314	64,355	65,309	66,758	67,846

Source(s): CANSIM table 379-0027.

Table 3.8
Employment by industry

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
percent										
Agriculture, forestry and logging with support activities, fishing, hunting and trapping	4.4	4.3	4.2	4.4	4.3	4.3	4.3	4.1	4.0	3.9
Mining and oil and gas extraction	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.3
Utilities	1.0	1.0	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.8
Construction	6.0	6.2	6.2	5.7	5.6	5.4	5.5	5.5	5.3	5.3
Manufacturing	16.5	16.4	15.7	14.7	14.3	13.9	14.0	14.3	14.3	14.7
Trade	16.2	15.8	15.9	16.0	16.0	15.8	15.8	15.6	15.6	15.4
Transportation and warehousing	5.2	5.1	4.9	4.9	4.8	4.8	4.9	5.0	5.0	5.1
Finance, insurance, real estate and leasing, business, building and other support services	8.5	8.8	9.0	9.1	9.1	9.2	9.2	9.4	9.6	9.5
Professional, scientific and technical services	4.2	4.3	4.4	4.7	4.6	4.8	4.9	5.1	5.3	5.7
Educational services	6.4	6.4	6.4	6.7	7.0	7.1	7.1	7.0	6.8	6.7
Health care and social assistance	9.4	9.5	9.8	10.2	10.4	10.5	10.4	10.4	10.4	10.1
Information, culture and recreation	4.0	4.1	3.9	3.9	3.9	3.9	4.1	4.3	4.3	4.4
Accommodation and food services	5.7	5.8	5.9	5.9	6.0	6.0	6.1	6.1	6.3	6.4
Other services	4.8	4.7	4.6	4.6	4.7	4.9	5.0	4.9	4.9	5.0
Public administration	6.2	6.2	6.4	6.6	6.8	6.7	6.4	6.2	6.0	5.8
Total, all industries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
percent										
Agriculture, forestry and logging with support activities, fishing, hunting and trapping	3.8	3.6	3.3	2.8	2.8	2.8	2.7	2.7	2.6	2.5
Mining and oil and gas extraction	1.3	1.1	1.1	1.2	1.1	1.1	1.2	1.3	1.5	1.5
Utilities	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.7	0.8
Construction	5.2	5.3	5.5	5.5	5.7	5.8	6.0	6.3	6.5	6.7
Manufacturing	14.9	15.2	15.2	14.9	14.9	14.5	14.4	13.7	12.8	12.1
Trade	15.1	15.4	15.5	15.8	15.7	15.7	15.7	15.9	16.0	15.9
Transportation and warehousing	5.1	5.1	5.2	5.2	5.0	5.0	5.0	4.9	4.9	4.9
Finance, insurance, real estate and leasing, business, building and other support services	9.4	9.5	9.4	9.5	9.6	9.7	10.0	10.2	10.5	10.4
Professional, scientific and technical services	6.1	6.3	6.3	6.6	6.4	6.4	6.4	6.5	6.6	6.7
Educational services	6.6	6.7	6.6	6.6	6.6	6.6	6.5	6.8	7.0	7.0
Health care and social assistance	10.2	10.0	10.3	10.3	10.6	10.7	10.9	10.7	10.8	10.9
Information, culture and recreation	4.4	4.4	4.5	4.7	4.7	4.6	4.6	4.5	4.5	4.6
Accommodation and food services	6.5	6.3	6.4	6.3	6.4	6.4	6.3	6.2	6.2	6.3
Other services	5.0	5.0	4.7	4.5	4.5	4.6	4.4	4.3	4.3	4.3
Public administration	5.6	5.4	5.2	5.3	5.2	5.2	5.2	5.2	5.1	5.1
Total, all industries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note(s): Figures may not add up to totals due to rounding.

Source(s): CANSIM table 282-0008.

Table 3.9
Exports and imports¹

	Agricultural and fishing products		Energy products		Forestry products		Industrial goods and materials		Machinery and equipment	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
percent										
1972	12.6	8.3	8.2	5.7	17.1	1.3	23.0	19.6	11.2	26.4
1973	13.9	9.5	9.4	5.7	17.2	1.4	23.1	19.1	10.8	26.7
1974	13.1	8.9	15.5	10.5	16.6	1.3	23.1	21.0	10.3	25.6
1975	13.4	8.5	15.5	11.9	14.7	1.3	21.5	18.0	11.7	26.0
1976	11.9	8.6	12.7	10.8	16.6	1.2	21.8	17.2	11.3	24.7
1977	11.4	8.7	11.9	9.9	17.3	1.1	21.8	17.2	10.4	24.1
1978	11.0	8.4	10.8	8.9	17.6	1.1	21.7	18.5	11.3	25.3
1979	10.9	7.6	13.2	9.2	17.5	1.2	22.6	20.5	13.1	26.4
1980	11.6	7.7	13.6	12.1	15.6	0.9	26.1	21.1	13.7	27.7
1981	12.1	7.4	13.4	12.2	14.4	0.9	23.9	20.2	14.3	28.4
1982	12.6	8.0	14.4	9.9	13.2	0.8	20.6	19.3	14.4	27.8
1983	11.9	7.4	13.8	6.8	13.6	1.0	19.5	20.0	13.1	27.5
1984	10.1	6.8	12.4	6.4	12.9	0.9	19.1	19.1	13.4	27.8
1985	8.5	6.0	13.3	6.0	12.5	0.8	18.6	18.7	13.9	26.6
1986	8.7	6.3	8.8	4.4	14.2	0.9	20.6	18.7	16.2	27.2
1987	9.0	6.2	9.8	5.0	16.0	1.0	20.8	18.1	15.8	27.9
1988	8.6	5.7	8.9	3.9	15.0	1.0	22.3	19.3	15.1	30.7
1989	7.9	5.9	9.3	4.5	14.6	1.0	22.0	19.3	16.3	31.1
1990	8.8	6.2	9.2	5.8	13.4	0.9	21.1	18.7	19.0	30.4
1991	8.9	6.4	9.6	4.7	12.6	0.9	21.2	17.6	19.8	30.5
1992	9.4	6.3	9.5	4.2	12.2	0.9	19.8	17.7	19.5	30.2
1993	8.5	6.2	9.3	3.9	12.3	0.9	18.5	18.2	19.4	30.0
1994	8.2	6.1	8.4	3.3	12.8	0.9	18.6	18.9	20.0	31.6
1995	7.9	5.8	7.7	3.1	13.8	0.9	19.2	19.8	21.1	32.9
1996	8.3	5.9	9.3	4.0	12.3	0.8	18.7	19.6	22.1	32.1
1997	8.2	5.6	9.0	3.8	11.6	0.9	18.7	19.6	22.7	32.9
1998	7.7	5.7	7.3	2.8	10.8	0.8	18.1	19.9	24.7	33.3
1999	6.9	5.4	8.1	3.3	10.9	0.8	16.2	19.0	24.0	33.1
2000	6.4	5.1	12.4	4.9	10.0	0.8	15.8	19.1	25.6	33.9
2001	7.4	5.8	13.3	5.1	9.6	0.8	16.1	19.5	24.4	32.0
2002	7.5	6.1	11.9	4.6	9.0	0.9	16.9	19.3	23.4	29.7
2003	7.3	6.3	15.2	5.8	8.6	0.9	16.7	19.0	22.2	28.8
2004	7.2	5.9	15.9	6.8	9.2	0.9	18.2	20.2	21.2	28.7
2005	6.7	5.7	19.2	8.7	8.1	0.8	18.7	20.2	20.8	28.6
2006	6.9	5.8	19.0	8.6	7.3	0.8	20.6	20.8	20.8	28.3
2007	7.4	6.1	19.8	8.8	6.2	0.7	22.4	20.5	20.5	28.1

See footnotes at the end of the table.

Table 3.9 – continued

Exports and imports¹

	Automotive products		Other consumer goods ²		Special transactions trade		Unallocated balance of payments adjustments	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
percent								
1972	22.4	25.7	1.5	10.8	0.2	1.1	3.6	1.0
1973	20.3	25.6	1.5	10.6	0.2	1.1	3.6	0.3
1974	16.9	21.8	1.4	9.7	0.3	0.9	2.9	0.3
1975	18.6	23.2	1.3	9.6	0.2	0.9	3.0	0.7
1976	20.9	24.7	1.3	10.9	0.4	1.3	3.1	0.6
1977	22.6	26.7	1.3	10.6	0.2	1.0	3.1	0.8
1978	22.6	26.1	1.4	10.5	0.2	0.8	3.5	0.4
1979	17.6	23.8	1.5	9.9	0.3	0.9	3.3	0.6
1980	13.8	19.1	1.6	9.7	0.3	1.1	3.8	0.6
1981	15.6	19.7	1.6	9.6	0.8	1.2	3.9	0.6
1982	19.4	21.4	1.6	10.8	0.3	1.5	3.5	0.5
1983	22.8	24.7	1.6	11.1	0.3	1.3	3.4	0.3
1984	25.4	26.7	1.6	10.7	0.4	1.6	4.7	0.0
1985	26.9	29.0	1.6	9.8	0.3	1.5	4.4	1.6
1986	25.3	28.6	2.0	10.4	0.4	1.5	3.8	2.1
1987	24.2	27.3	2.0	10.6	0.5	1.7	1.8	2.2
1988	24.2	25.0	2.0	10.2	0.5	1.6	3.4	2.7
1989	23.1	22.9	1.8	10.8	0.5	1.5	4.5	2.9
1990	22.8	21.6	2.2	11.2	1.1	2.1	2.4	3.0
1991	22.0	22.0	2.4	11.8	1.1	2.6	2.5	3.6
1992	23.3	21.8	2.7	12.3	1.1	2.6	2.4	4.0
1993	25.6	22.6	2.9	12.1	1.1	2.5	2.4	3.8
1994	25.2	23.0	3.1	11.3	1.1	2.3	2.4	2.6
1995	23.7	21.8	3.1	11.1	1.1	2.4	2.3	2.2
1996	22.6	21.5	3.4	10.9	1.1	3.0	2.2	2.2
1997	22.9	21.9	3.5	10.7	1.3	2.5	2.1	2.0
1998	24.0	22.0	3.8	11.4	1.7	2.1	2.0	1.9
1999	26.4	23.2	3.8	11.3	2.0	1.9	1.7	1.9
2000	22.8	21.4	3.5	11.1	1.9	1.8	1.6	1.8
2001	22.0	20.7	3.9	12.3	1.9	2.0	1.5	1.8
2002	23.3	22.8	4.3	13.0	2.0	1.7	1.6	1.8
2003	21.9	22.3	4.3	13.5	1.9	1.5	1.8	1.8
2004	21.1	21.3	4.0	13.1	1.9	1.4	1.5	1.8
2005	19.5	20.2	3.8	12.7	1.8	1.2	1.4	1.9
2006	18.1	19.7	3.9	12.9	1.9	1.2	1.4	2.0
2007	16.7	19.2	4.1	13.2	1.8	1.2	1.2	2.1

1. Merchandise imports and exports by sector, balance of payments basis—transactions are defined in terms of ownership change.

2. Includes apparel and footwear, televisions, radios, printed matter, watches, sporting goods and toys, house furnishings, photographic goods, and other miscellaneous end products.

Source(s): CANSIM table 228-0043.

Table 3.10
Water transport

	Freight loaded		Freight unloaded		Total freight handled	Containerized freight handled		Movement of freight	Passengers transported by ferry
	Domestic	International	Domestic	International		Domestic	International		
millions of tonnes									
1988	70.0	171.1	70.0	78.9	389.9	1.6	12.6	1,711,417	38.7
1989	62.0	159.1	62.0	80.3	363.4	1.4	12.1	1,644,117	40.8
1990	60.4	159.0	60.4	73.3	353.0	1.3	12.3	1,614,007	40.4
1991	57.9	168.0	57.9	66.1	349.9	0.8	12.2	1,708,082	40.0
1992	52.3	153.8	52.3	69.3	327.7	1.0	12.6	1,578,228	40.0
1993	50.4	152.6	50.4	71.6	324.9	0.9	13.3	1,561,072	41.2
1994	52.2	170.0	52.2	76.9	351.3	0.8	14.7	1,697,225	43.2
1995	50.4	176.5	50.4	83.2	360.5	0.8	15.6	1,775,238	42.0
1996	48.8	174.3	48.8	85.6	357.5	0.8	17.1	1,781,143	39.8
1997	46.7	187.9	46.7	94.7	376.1	1.0	18.8	1,967,095	38.2
1998	48.3	179.0	48.3	100.4	376.0	0.9	19.7	1,876,328	37.3
1999	52.2	179.6	52.2	101.6	385.6	0.9	22.5	1,881,141	39.2
2000	54.5	187.8	54.5	105.9	402.8	0.9	24.0	1,969,105	38.5
2001	53.9	174.7	53.9	112.1	394.7	0.9	23.5	1,872,856	39.0
2002	62.8	174.3	62.6	108.5	408.1	1.0	25.6	1,765,822	39.4
2003	68.5	191.4	68.6	115.3	443.8	1.0	28.2	1,967,931	38.9
2004	68.9	196.1	68.9	118.5	452.3	1.1	31.2	2,047,686	38.7

1. The movement of one tonne over a distance of one kilometre.

Source(s): Statistics Canada, Transportation Division; Shipping in Canada, catalogue no. 54-205-X. Transport Canada, Surface and Marine Statistics and Forecasts.

Table 3.11
(continued)

	Freight movement		Passenger movement		Locomotives	Passenger cars	Freight cars	Total diesel	Total track operated
	Revenue and non-revenue freight, tonnes	Revenue and non-revenue freight, tonne-kilometres ²	Revenue passengers, passengers	Revenue passengers, passenger-kilometres ³					
millions									
1999	344.0	301,977	3.9	1,510	2,608	329	89,971	1,950	74,052
2000	363.5	325,206	4.2	1,549	2,508	333	88,018	1,977	74,412
2001	356.9	325,040	4.2	1,553	2,535	323	87,019	1,982	73,821
2002	345.7	321,318	4.3	1,597	2,480	372	82,632	1,970	73,186
2003	353.0	321,804	4.0	1,434	2,512	461	82,346	2,008	71,920
2004	374.1	343,858	4.0	1,421	2,552	480	84,276	2,097	72,048
2005	382.6	356,202	4.3	1,478	2,683	512	93,947	2,130	72,367
2006	365.3	356,735	4.2	1,450	2,689	520	91,428	2,120	72,245

1. Common carrier railways operating in Canada that provide for-hire passenger and freight services are included. Excluded from the survey are companies that provide rail support services (bridge and terminal service etc.) and sightseeing tours.

2. The movement of one tonne over a distance of one kilometre.

3. The movement of a passenger over a distance of one kilometre. Passenger-kilometres are derived by multiplying the number of passengers by the distance travelled.

Source(s): CANSIM tables 404-0010, 404-0012, 404-0016 and 404-0017.

Table 3.12
Truck transport

	Freight carried		Shipments		
	Tonnes	Tonne-kilometres ¹	Number of shipments	Weight per shipment	Distance per shipment
	millions	kilograms			
1989	189.6	77,383	34.9	5,431	621
1990	174.2	77,069	30.0	5,816	647
1991	150.6	70,048	29.1	5,178	648
1992	149.5	72,276	27.6	5,410	656
1993	173.4	83,968	27.9	6,208	659
1994	195.6	101,873	30.5	6,418	641
1995	210.9	109,434	32.3	6,523	685
1996	229.0	120,459	35.2	6,509	709
1997	223.3	130,141	32.0	6,962	792
1998	233.9	137,552	33.8	6,914	776
1999	269.3	158,104	36.4	7,396	771
2000	278.4	164,720	35.6	7,830	798
2001	288.0	170,915	37.0	7,775	803
2002	293.6	177,210	38.6	7,607	782
2003	305.2	184,957	40.4	7,559	797
2004	306.1	193,211	40.6	7,540	827

1. The movement of one tonne over a distance of one kilometre.

Note(s): These figures pertain only to the long distance shipments of Canada-based long distance for-hire trucking carriers.

Source(s): Statistics Canada, Transportation Division; Trucking in Canada, catalogue no. 53-222-X.

Table 3.13
Air transport

	Freight carried		Passengers	
	Weight	Tonne-kilometres ¹	Passengers	Passenger-kilometres ²
	tonnes	millions		
1988	591,250	1,516	34.8	62,141
1989	603,828	1,552	35.7	65,628
1990	628,180	1,727	36.3	66,608
1991	603,267	1,565	31.3	57,953
1992	596,812	1,493	31.9	62,117
1993	624,561	1,636	31.1	60,985
1994	653,444	1,791	32.5	65,636
1995	692,579	2,034	36.0	73,506
1996	721,260	2,168	39.6	82,270
1997	789,146	2,353	43.6	92,104
1998	822,185	2,280	45.2	96,643
1999	832,987	2,364	46.4	99,623
2000	845,809	2,327	46.8	104,917
2001	789,625	2,149	45.4	102,473
2002	786,607	2,151	40.5	95,094
2003	662,612	1,855	41.5	90,326
2004	694,458	2,013	45.6	101,965
2005	779,930	2,236	48.1	109,975
2006	795,709	2,235	51.9	121,226

1. The movement of one tonne over a distance of one kilometre.

2. The movement of a passenger over a distance of one kilometre. Passenger-kilometres are derived by multiplying the number of passengers by distance travelled.

Note(s): Figures include all Canadian carriers that earned more than 1 million dollars in revenue during each of the previous two years.

Source(s): Statistics Canada, Transportation Division; Service Bulletin, Aviation, catalogue no. 51-004-X, vol. 40, no. 1.

Table 3.14
Motor vehicle registrations

	Road motor vehicles					Trailers	Off-road, construction, farm vehicles	
	Vehicles weighing less than 4,500 kilograms	Vehicles weighing 4,500 kilograms to 14,999 kilograms	Vehicles weighing 15,000 kilograms or more	Buses	Motorcycles and mopeds	Total, road motor vehicle registrations		
thousands								
2001	17,055	387	267	74	318	18,102	4,023	1,302
2002	17,544	367	277	79	350	18,617	4,161	1,419
2003	17,769	379	282	80	373	18,884	4,316	1,488
2004	17,990	394	286	78	409	19,156	4,514	1,527
2005	18,275	416	302	79	444	19,515	4,723	1,600
2006	18,739	443	318	80	485	20,065	4,961	1,658
2007	19,199	461	328	83	522	20,593	5,231	1,753

Note(s): In 1999, Statistics Canada implemented a revised methodology for motor vehicle registration data in Canada. These data are not comparable with motor vehicle registrations prior to 1999.

Source(s): CANSIM table 405-0004.

Table 3.15
Usual mode of transportation for travel to work

	1996	2001	Change 1996 to 2001	1996	2001	Percentage change 1996 to 2001
	number of workers			percent		
Car, truck, van, as driver	8,934,025	9,929,470	995,445	73.3	73.8	11.1
Car, truck, van, as passenger	899,340	923,975	24,635	7.4	6.9	2.7
Public transportation	1,233,870	1,406,585	172,715	10.1	10.5	14
Walk	850,855	881,085	30,230	7.0	6.6	3.6
Bicycle	137,435	162,910	25,475	1.1	1.2	18.5
Other	127,885	146,835	18,950	1.0	1.1	14.8
Total	12,183,410	13,450,855	1,267,445	100.0	100.0	10.4

Source(s): Statistics Canada, Where Canadians work and how they get there, 2001 Census: analysis series,
<http://www12.statcan.ca/english/census01/Products/Analytic/companion/pow/pdf/96F0030XIE2001010.pdf> (accessed March 17, 2006).

Table 3.16

Usual mode of transportation for travel to work, by census metropolitan areas (CMA), 2001

	All modes	Car, truck, van		Public transportation	Walk	Bicycle	Other
		As driver	As passenger				
number of workers							
St. John's	75,735	77.3	12.3	2.8	5.9	0.1	1.6
Halifax	170,210	68.1	9.6	9.9	10.3	0.9	1.2
Saint John	53,050	76.5	10.5	4.3	6.9	0.4	1.4
Chicoutimi-Jonquière ¹	62,765	85.1	4.9	2.4	5.9	0.8	0.9
Québec	325,005	76.0	5.2	9.8	7.0	1.3	0.7
Sherbrooke	70,365	80.0	5.7	5.6	7.2	0.8	0.7
Trois-Rivières	57,610	84.3	4.6	3.0	6.0	1.5	0.6
Montréal	1,580,270	65.6	4.8	21.7	5.9	1.3	0.7
Ottawa-Hull ²	525,070	64.6	7.4	18.5	6.8	1.9	0.8
Kingston	65,375	74.2	8.2	3.5	10.4	2.2	1.5
Oshawa	142,430	80.2	7.7	7.1	3.6	0.5	0.9
Toronto	2,248,055	65.2	6.3	22.4	4.6	0.8	0.7
Hamilton	304,900	78.2	7.1	8.0	5.1	0.9	0.7
St. Catharines-Niagara	167,980	83.8	7.4	2.0	5.0	0.9	0.9
Kitchener	206,805	81.3	8.1	3.9	4.9	1.1	0.7
London	200,125	77.9	7.8	6.0	5.9	1.5	0.9
Windsor	137,590	83.8	6.5	3.1	4.7	1.1	0.8
Greater Sudbury ³	67,380	78.2	8.8	4.9	6.5	0.4	1.2
Thunder Bay	54,325	82.5	7.0	3.0	5.4	1.0	1.1
Winnipeg	327,740	70.0	8.4	13.2	6.1	1.4	0.9
Regina	94,295	80.3	7.9	4.4	5.2	1.4	0.8
Saskatoon	106,025	79.7	6.6	4.1	5.8	2.5	1.3
Calgary	499,050	71.8	6.8	13.2	5.9	1.5	0.8
Edmonton	469,225	77.7	6.6	8.6	4.7	1.2	1.2
Abbotsford	61,880	84.4	8.7	1.6	3.6	0.9	0.8
Vancouver	905,995	72.2	7.0	11.5 ⁴	6.5	1.9	0.9
Victoria	140,515	67.5	6.0	9.7	10.4	4.8	1.6
All CMAs	9,119,770	70.8	6.6	14.8	5.7	1.3	0.8

1. Now known as Saguenay.

Source(s): Statistics Canada, Where Canadians work and how they get there, 2001 Census: analysis series,

<http://www12.statcan.ca/english/census01/Products/Analytic/pow/pdf/96F0030XIE2001010.pdf> (accessed March 17, 2006).

Table 3.17

Consumption of refined petroleum products¹ by transportation industry

Railways	Total airlines ²	Total marine ²	Road transport and urban transit	Retail pump sales	Pipelines ³	Total
thousands of cubic metres						
1992	2,240	3,921	2,711	4,656	32,067	12
1993	2,232	3,756	2,397	5,104	33,048	8
1994	2,310	4,015	2,574	5,978	34,208	30
1995	2,092	4,244	2,523	6,450	34,251	36
1996	2,046	4,941	2,480	6,690	34,849	57
1997	2,074	5,082	2,481	7,147	35,778	13
1998	1,999	5,227	2,919	7,197	36,817	24
1999	2,116	5,583	2,741	7,345	37,902	24
2000	2,169	5,634	2,801	7,175	38,100	21
2001	2,132	5,015	3,016	6,721	38,448	12
2002	1,934	5,299	2,718	6,871	38,665	9
2003	1,927	5,336	2,524	7,368	39,728	20
2004	1,959	5,822	2,803	7,573	41,192	25
2005	2,060	6,017	2,728	8,028	40,809	20
2006	2,124	5,970	2,451	7,973	40,935	20

1. Refined petroleum products refers to motor gasoline, diesel fuel oil, light fuel oil, heavy fuel oil, aviation gasoline and aviation turbo fuel.

2. Includes fuels purchased in Canada by domestic and foreign companies.

3. The volume used to operate and run the pumps at the pumping stations.

Note(s): Figures may not add up to totals due to rounding.

Source(s): CANSIM tables 128-0003 and 128-0010.

Table 3.18

Fuel consumption and number of vehicles by passenger bus and urban transit industries, 2005

	Fuel consumed			Electricity	Number of vehicles
	Diesel	Gasoline	Other fuel		
	thousands of litres			thousands of kilowatts	
Total	787,669	10,208	32,655	x	58,995
Urban transit systems	409,392	539	24,978	795,220	16,217
Interurban and rural bus transportation	76,360	x	0	0	3,285
School and employee bus transportation	217,806	5,207	F	0	34,814
Charter bus	53,310	F	F	0	2,163
Other transit - shuttle	12,531	3,620	4,729	0	1,736
Sight-seeing	1,834	102	x	0	184
Other ¹	16,434	0	0	x	596

1. Comprised mostly of municipal transit operations that are part of municipal budgets rather than separate operating entities.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Transportation Division; Service Bulletin - Surface and Marine Transport, Catalogue no. 50-002-X, vol. 23 no.1.

Table 3.19
Number of farms by province

	Total	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec
number						
1871	367,862	...	...	46,316	31,202	118,086
1881	464,025	...	13,629	55,873	36,837	137,863
1891 1	542,181	...	14,549	60,122	38,577	174,996
1901 1	511,073	...	13,748	54,478	37,006	140,110
1911 1	682,329	...	14,113	52,491	37,755	149,701
1921	711,090	...	13,701	47,432	36,655	137,619
1931	728,623	...	12,865	39,444	34,025	135,957
1941	732,832	...	12,230	32,977	31,889	154,669
1951	623,087	3,626	10,137	23,515	26,431	134,336
1961	480,877	1,752	7,335	12,518	11,786	95,777
1971	366,110	1,042	4,543	6,008	5,485	61,257
1981	318,361	679	3,154	5,045	4,063	48,144
1991	280,043	725	2,361	3,980	3,252	38,076
1996	276,548	742	2,217	4,453	3,405	35,991
2001	246,923	643	1,845	3,923	3,034	32,139
2006	229,373	558	1,700	3,795	2,776	30,675
number						
	Total	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
1871	367,862	172,258	9,077	...	...	2,743
1881	464,025	206,989	22,008	9,244 3	...	6,490
1891 1	542,181	216,195	32,252	13,445	9,479	6,501
1901 1	511,073	204,054	43,631 4	95,013 4	60,559 4	16,958
1911 1	682,329	212,108	53,252 4	119,451 4	82,954 4	21,973
1921	711,090	198,053	54,199	136,472	97,408	26,079
1931	728,623	192,174	58,024	138,713	99,732	26,394
1941	732,832	178,204	52,383	112,018	84,315	26,406
1951	623,087	149,920	43,306	93,924	73,212	19,934
1961	480,877	121,333	34,981	76,970	62,702	18,400
1971	366,110	94,722	29,442	67,318	58,056	20,012
1981	318,361	82,448	25,706	60,840	57,245	19,225
1991	280,043	68,633	21,071	50,598	53,652	21,835
1996	276,548	67,520	24,383	56,995	59,007	20,290
2001	246,923	59,728	19,054	44,329	49,431	19,844

1. Excludes plots under one acre, to attain comparability with data for later years.

2. Data comprise the portion of the Northwest Territories located west of Manitoba.

3. Data comprise the districts of Assiniboia, Saskatchewan and Alberta.

4. Data exclude farms located on Indian reserves.

Source(s): Historical Statistics of Canada, Second Edition, F.H. Leacy (ed.), Catalogue no. 11-516-X, 1983; Selected Historical Data from the Census of Agriculture, Catalogue no. 95-632-X, 2007, Census of Agriculture.

Table 3.20
Gross domestic product of fishing industries

	Total gross domestic product	Fishing industries			Total	Share of total gross domestic product
		Fishing, hunting and trapping	Seafood product preparation and packaging			
millions of chained 2002 dollars						
1998	922,584	972	710		1,682	0.18
1999	974,405	956	837		1,793	0.18
2000	1,026,242	985	870		1,855	0.18
2001	1,040,943	1,085	868		1,952	0.19
2002	1,068,765	1,118	951		2,069	0.19
2003	1,091,378	1,138	1,018		2,156	0.20
2004	1,126,802	1,175	1,020		2,195	0.19
2005	1,160,024	1,052	988		2,040	0.18
2006	1,193,905	1,069	996		2,065	0.17
2007	1,224,319	1,144	926		2,070	0.17

Source(s): CANSIM table 379-0027.

Table 3.21
Employment in the fishing industries

	Total employment	Fishing industries			Total	Share of total employment
		Fishing	Animal aquaculture	Seafood product preparation and packaging		
thousands of persons						
1987	12,333	33.4	2.3	31.6	67.3	0.55
1988	12,710	37.5	1.6	35.3	74.4	0.59
1989	12,996	36.9	2	33.8	72.7	0.56
1990	13,086	37.1	2.5	30.7	70.3	0.54
1991	12,857	40.9	3	29.5	73.4	0.57
1992	12,731	35.1	3.1	29.4	67.6	0.53
1993	12,793	36.2	2.9	25.5	64.6	0.5
1994	13,059	35.2	2.5	25.2	62.9	0.48
1995	13,295	28.5	2.2	22.6	53.3	0.4
1996	13,421	30.1	3.2	20.2	53.5	0.4
1997	13,706	29.7	3.9	22.5	56.1	0.41
1998	14,046	29.5	2.5	22.4	54.4	0.39
1999	14,407	29.1	3.4	24.8	57.3	0.4
2000	14,764	28.5	4.7	22.9	56.1	0.38
2001	14,946	25.7	4.1	23.7	53.5	0.36
2002	15,310	25.6	3.2	27.6	56.4	0.37
2003	15,672	26.2	3.1	24.3	53.6	0.34
2004	15,947	26.5	3.5	25.9	55.9	0.35
2005	16,170	25.8	5.0	24.2	55.0	0.34
2006	16,484	26.1	4.4	21.6	52.1	0.32
2007	16,866	23.7	5.1	20.1	48.8	0.29

Source(s): Statistics Canada, Labour Force Survey, special tabulation, unpublished data and Statistics Canada, CANSIM table 282-0088.

Table 3.22
Exports and imports of fish and fish products

	Exports			Imports		
	Total exports	Fish fresh, frozen, preserved and canned	Share of total exports	Total imports	Fish and marine animals	Share of total imports
	millions of dollars		percent	millions of dollars		percent
1972	20,222	340	1.68	18,272	81	0.44
1973	25,649	484	1.89	22,726	110	0.48
1974	32,738	418	1.28	30,903	119	0.38
1975	33,616	451	1.34	33,962	134	0.39
1976	38,166	590	1.54	36,608	182	0.50
1977	44,495	795	1.79	41,523	219	0.53
1978	53,361	1,111	2.08	49,048	248	0.51
1979	65,582	1,271	1.94	61,157	310	0.51
1980	76,680	1,265	1.65	67,903	354	0.52
1981	84,432	1,494	1.77	77,140	360	0.47
1982	84,393	1,591	1.89	66,738	352	0.53
1983	90,556	1,563	1.73	73,098	418	0.57
1984	111,330	1,595	1.43	91,493	488	0.53
1985	119,061	1,849	1.55	102,669	494	0.48
1986	125,172	2,580	2.06	115,195	613	0.53
1987	131,484	2,957	2.25	119,324	691	0.58
1988	143,534	2,818	1.96	132,715	679	0.51
1989	146,963	2,530	1.72	139,216	738	0.53
1990	152,056	2,817	1.85	141,000	679	0.48
1991	147,669	2,636	1.79	140,658	736	0.52
1992	163,464	2,736	1.67	154,430	777	0.50
1993	190,213	2,868	1.51	177,123	996	0.56
1994	228,167	3,258	1.43	207,872	1,126	0.54
1995	265,334	3,496	1.32	229,936	1,286	0.56
1996	280,079	3,444	1.23	237,689	1,470	0.62
1997	303,378	3,498	1.15	277,726	1,434	0.52
1998	327,162	3,664	1.12	303,399	1,636	0.54
1999	369,035	4,261	1.15	327,026	1,870	0.57
2000	429,372	4,561	1.06	362,337	1,929	0.53
2001	420,730	4,722	1.12	350,071	1,945	0.56
2002	414,038	5,240	1.27	356,727	1,935	0.54
2003	399,122	4,987	1.25	342,710	1,812	0.53
2004	429,067	4,858	1.13	363,308	1,804	0.50
2005	451,783	4,673	1.03	388,282	1,823	0.47
2006	455,696	4,463	0.98	404,395	1,816	0.45

Source(s): CANSIM table 228-0003.

1 catch and value

	Groundfish 1		Pelagic fish 2		Shellfish 3		Total 4	
	Catch	Value	Catch	Value	Catch	Value	Catch	Value
	tonne (live weight)	thousands of dollars	tonne (live weight)	thousands of dollars	tonne (live weight)	thousands of dollars	tonne (live weight)	thousands of dollars
1990	791,246	475,491	560,238	425,690	246,796	518,244	1,624,792	1,432,494
1991	792,383	500,184	431,514	293,514	247,199	580,985	1,506,966	1,392,490
1992	630,574	415,422	389,644	315,887	265,243	647,967	1,317,602	1,397,032
1993	431,407	297,814	418,817	364,067	284,396	730,487	1,154,408	1,419,576
1994	332,896	252,858	351,139	402,321	313,434	1,013,681	1,031,024	1,699,994
1995	220,710	232,210	302,013	242,458	305,165	1,270,278	858,039	1,781,263
1996	274,086	231,609	310,941	269,575	299,562	1,037,063	918,663	1,579,576
1997	276,317	255,308	323,497	222,455	337,297	1,081,094	977,940	1,599,953
1998	287,498	288,029	319,085	166,369	355,523	1,134,154	994,575	1,611,592
1999	298,264	324,995	286,236	124,061	382,486	1,435,695	1,003,063	1,910,165
2000	229,637	309,511	305,813	186,734	429,937	1,617,924	1,003,500	2,137,792
2001 p	274,925	302,344	307,672	171,916	433,100	1,618,301	1,053,338	2,118,552
2002 p	255,994	284,244	315,275	186,949	458,996	1,688,199	1,073,988	2,198,050
2003 p	255,614	302,496	348,728	185,743	466,742	1,753,631	1,120,060	2,278,953
2004 p	306,693	290,826	331,687	173,995	491,880	1,769,258	1,176,229	2,275,860
2005 p	304,286	313,854	324,465	184,387	443,537	1,550,581	1,096,645	2,076,771
2006 p	262,209	321,253	314,847	191,134	457,019	1,303,426	1,048,942	1,854,268

- Species that are usually caught near the ocean bottom, including cod, haddock, pollock, redfish, halibut, flounder, and many others.
- The pelagic species live in midwater or close to the surface. They include herring, capelin, swordfish, tuna, and many others.
- Aquatic shelled molluscs (oysters, etc.) and crustaceans (crabs, shrimp, etc.).
- Data do not add up because total also includes marine plants, lumpfish roe and miscellaneous other marine products.

Source(s): Department of Fisheries and Oceans, Statistical Services, 2006,

http://www.dfo-mpo.gc.ca/communic/statistics/commercial/landings/seafisheries/index_e.htm (accessed November 5, 2007).

Table 6.21
Aquaculture production and value

	Total aquaculture 2		Salmon 3		Trout 4		Oysters		Mussels 3	
	tonnes	thousands of dollars	tonnes	thousands of dollars	tonnes	thousands of dollars	tonnes	thousands of dollars	tonnes	thousands of dollars
1991	49,594	233,559	34,109	195,538	3,324	15,575	5,900	5,952	3,956	4,875
1992	46,931	244,014	30,325	202,735	3,927	20,234	5,843	6,049	4,877	5,696
1993	53,927	277,604	36,670	234,036	4,121	21,737	6,036	6,573	5,141	5,727
1994	57,147	301,992	36,083	249,152	4,434	24,169	7,534	9,081	6,867	7,575
1995	66,269	341,957	42,515	286,852	5,316	26,216	7,719	9,702	8,626	9,891
1996	72,572	356,241	45,624	287,154	7,712	38,993	7,989	10,710	9,898	12,022
1997	81,843	385,447	56,775	324,030	6,876	33,629	5,631	8,695	11,570	13,834
1998	91,499	430,414	58,618	349,043	8,376	42,123	8,137	11,321	15,018	18,965
1999	113,253	558,365	72,890	450,084	12,576	60,830	8,785	13,278	17,397	23,185
2000	127,336	601,326	82,195	483,755	12,037	57,289	9,624	16,515	21,290	27,189
2001	153,326	597,676	105,606	470,471	11,218	51,193	11,319	16,772	21,566	30,404
2002	171,035	620,288	126,321	502,036	8,867	42,811	11,520	15,176	20,615	31,449
2003	150,205	583,285	99,961	441,471	6,403	32,038	13,621	19,208	20,590	30,929
2004	141,580	532,924	90,646	400,180	4,858	22,086	13,228	16,740	22,863	32,807
2005	154,388	706,648	98,369	543,337	4,787	21,071	12,957	16,536	22,930	33,582
2006	170,938	902,695	118,058	748,234	5,033	21,809	12,488	18,522	23,822	35,739

- The production and value of aquaculture includes the amount and value produced on sites and excludes hatcheries or processing. Shellfish also includes some wild production. The data, collected from each of the provincial departments responsible for aquaculture, are considered accurate and reliable. The data will continue to be collected and released in the year following the reference year.
- Excludes other finfish for all provinces.
- Excludes confidential data at Canada level.
- Includes steelhead.

Source(s): CANSIM table 003-0001.

Table 3.25

Volume of roundwood harvested by forest product category, selected years

	Industrial roundwood			Fuelwood and firewood	Total roundwood harvested
	Logs and bolts ¹	Pulpwood	Other		
thousands of cubic metres					
1940	32,625	20,981	2,109	55,715	75,447
1945	30,596	26,412	2,039	59,047	76,235
1950	40,095	32,311	1,701	74,107	85,615
1955	44,262	38,721	1,691	84,674	92,882
1960	51,118	33,924	1,524	86,566	93,316
1965	62,618	34,164	1,838	98,620	103,745
1970	75,645	40,553	1,294	117,492	121,625
1975	73,542 ^r	37,270 ^r	915	111,727 ^r	115,510 ^r
1980	109,952	38,909	1,923	150,784	155,624 ^r
1985	119,317 ^r	40,620 ^r	2,077 ^r	162,014 ^r	168,722 ^r
1990	118,941 ^r	35,876 ²	1,581 ^r	156,398 ^r	162,567 ^r
1995	150,150 ^r	30,926 ³	2,081 ^r	183,156 ^r	188,497 ^r
2000	166,652 ^r	28,699 ^r	3,566 ^r	198,917 ^r	201,843 ^r
2001	154,417 ^r	23,079 ^r	5,449 ^r	182,945 ^r	185,854 ^r
2002	164,388 ²	26,042 ²	3,298 ²	193,727 ²	196,596 ²
2003	146,850 ²	27,902 ^r	3,315 ²	178,066 ^r	180,909 ^r
2004	173,107 ²	28,583 ²	3,583 ²	205,272 ²	208,062 ²
2005	164,048 ²	20,824 ²	3,221 ²	188,093 ²	191,042 ²

1. Logs are defined as the stem of a tree after it has been felled; the raw material from which lumber, plywood, and other wood products are processed. Bolts are defined as raw material used in the manufacture of shingles and shakes; short logs to be sawn for lumber or peeled for veneer.

2. Estimated by provincial or territorial forestry agency.

3. Estimated by the Canadian Forest Service or by Statistics Canada.

Source(s): Canadian Council of Forest Ministers, Compendium of Canadian Forestry Statistics, 2006, http://nfdp.ccfm.org/compendium/index_e.php (accessed June 19, 2007).

Table 3.26
Volume of roundwood harvested by province and territory

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
thousands of cubic metres							
1980	155,624 ^r	2,795 ^r	381	4,686	8,387	31,686	21,322
1981	144,736 ^r	2,568	371 ^r	4,112	7,795	34,234	22,808
1982	127,202 ^r	2,379	357 ^r	3,105	6,320	29,133	19,778
1983	155,983 ^r	2,429	381 ^r	2,596	7,442	36,288	23,736
1984	167,824 ^r	2,889	400 ^r	3,894	8,378	36,519	28,130
1985	168,722 ^r	2,509	411 ^r	3,515	7,896	35,400	28,225
1986	177,190 ^r	2,408	424 ^r	4,004	8,720	38,127	30,186
1987	191,685	2,524	480	4,789	7,869	39,503	29,692
1988	190,616 ^r	2,513	476 ^r	5,039	9,199	39,381	29,338
1989	188,254 ^r	2,535	416 ^r	4,772	9,281	36,192	29,642
1990	162,567 ^r	2,876 ²	448 ^r	4,639 ²	8,824 ²	30,148 ²	25,420 ²
1991	160,880 ^r	2,680	452 ^r	4,348	8,643	28,943 ²	23,829 ²
1992	170,131 ^r	2,821 ²	510 ²	4,248 ²	9,205	31,001 ^r	24,286 ³
1993	175,999 ^r	3,131 ²	534 ²	4,585 ²	8,959	34,091 ²	25,432 ²
1994	183,261 ²	2,445	519 ²	5,106 ²	9,269	38,231 ²	25,952 ³
1995	188,497 ^r	2,983	638	5,483 ²	10,055	41,438 ²	26,260 ³
1996	183,375 ^r	2,742 ²	557 ³	6,012 ²	10,902 ³	38,267 ²	25,871 ³
1997	188,750 ^r	2,558 ²	514 ^r	6,989 ²	11,253 ³	42,543 ²	26,595 ³
1998	176,957 ^r	2,398 ²	520	5,903 ^r	11,534 ²	43,427 ²	24,126 ³
1999	198,258 ^r	2,720 ²	693	6,164	11,294	45,646 ²	24,814 ²
2000	201,843 ^r	2,868 ²	716 ²	6,470 ^r	11,872	43,485 ²	28,118 ²
2001	185,854 ^r	2,556 ²	626 ²	6,182 ^r	10,186	40,579 ²	24,099 ²
2002	196,596 ²	2,561 ²	635 ²	6,066	10,457 ²	41,525 ²	26,327 ²
2003	180,909 ^r	2,289 ²	650 ²	6,085	10,788 ^r	40,102	24,347 ²
2004	208,062 ²	2,327 ²	657 ²	6,889	11,004	43,269	25,174 ²
2005	191,042 ²	2,400 ²	569 ²	6,249	30	38,461	23,371 ²
	Canada	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories
thousands of cubic metres							
1980	155,624 ^r	2,335	3,330	5,933	74,654	115	..
1981	144,736 ^r	1,803	3,555	6,586	60,780	124	..
1982	127,202 ^r	1,498	2,526	5,714	56,231	161	..
1983	155,983 ^r	1,520	2,612	7,344	71,443	192	..
1984	167,824 ^r	1,698	2,726	8,457	74,556	177	..
1985	168,722 ^r	1,717	3,016	8,979	76,868	186	..
1986	177,190 ^r	1,703	3,529	10,387	77,503	199	..
1987	191,685	1,887	3,666	10,496	90,591	188	..
1988	190,616 ^r	1,883	3,818	11,990	86,807	172	..
1989	188,254 ^r	1,848	3,685	12,293	87,414	176	..
1990	162,567 ^r	1,563 ²	2,758 ²	11,911	73,861	82	38
1991	160,880 ^r	1,278	2,957 ²	12,926 ²	74,706	79	40
1992	170,131 ^r	1,598	3,081 ²	14,594 ²	78,579	162	46
1993	175,999 ^r	1,539	4,433 ^r	14,897	78,004	193	203
1994	183,261 ²	1,786	4,468	19,790	75,093	421	181
1995	188,497 ^r	1,987	4,258	20,287	74,622 ³	357 ^r	127 ^r
1996	183,375 ^r	2,148	4,126	20,037	72,252 ³	254 ^r	207 ^r
1997	188,750 ^r	2,183	4,205	22,217	69,298 ³	253 ^r	143
1998	176,957 ^r	2,328	3,348	17,172	65,938 ²	110 ^r	154
1999	198,258 ^r	2,171	3,882	23,729	76,930	145 ^r	71
2000	201,843 ^r	2,188	4,197	23,418	78,457 ^r	33	202
2001	185,854 ^r	2,079	4,119	23,474	71,896	39	192
2002	196,596 ²	2,106	4,309	24,673	77,864	42	30
2003	180,909 ^r	2,106 ²	4,898	24,228	65,358	32	26
2004	208,062 ²	2,106 ²	6,103	23,510 ²	86,998	26	26
2005	191,042 ²	23	5,330	27,546 ^p	87,014 ²	24	..

1. Includes Nunavut.

2. Estimated by provincial or territorial forestry agency.

3. Estimated by the Canadian Forest Service or by Statistics Canada.

Source(s): Canadian Council of Forest Ministers, Compendium of Canadian Forestry Statistics, 2007, http://nfdp.ccfm.org/compendium/index_e.php (accessed July 3, 2007).

Table 3.27

Gross domestic product of forest products industries

Total gross domestic product	Forest products industries				Total	Share of total gross domestic product
	Forestry and logging	Sawmills and wood preservation	Other wood product manufacturing	Pulp, paper and paperboard mills		
millions of chained 2002 dollars						percent
1998	922,584	5,119	5,824	1,892	7,080	19,915
1999	974,405	5,302	5,951	2,191	8,046	21,490
2000	1,026,242	5,632	6,538	2,617	8,538	23,325
2001	1,040,943	5,676	6,018	2,643	7,737	22,074
2002	1,068,765	5,893	6,673	2,908	8,114	23,588
2003	1,091,378	5,756	6,607	2,970	8,060	23,393
2004	1,126,802	6,182	6,821	3,209	8,279	24,491
2005	1,160,024	6,168	6,761	3,332	7,926	24,187
2006	1,193,905	5,896	6,559	3,106	7,345	22,906
2007	1,224,319	5,278	5,801	3,028	7,007	21,115

Source(s): CANSIM table 379-0027.

Table 3.28

Employment in forest products industries¹ by province and territory

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
persons							
1993	204,053	1,448	.	3,625	13,423	57,788	39,462
1994	213,819	1,908	.	4,650	12,805	59,942	40,031
1995	214,688	2,116	.	3,957	13,722	62,321	39,881
1996	218,358	2,004	.	4,024	13,691	63,044	39,608
1997	225,356	2,305	.	4,451	14,237	66,734	43,000
1998	221,511	1,863	.	4,511	14,725	66,508	43,348
1999	228,248	1,639	.	4,447	14,636	67,666	44,379
2000	238,707	1,730	.	4,867	16,553	72,222	45,495
2001	221,921	1,715	.	4,010	15,671	67,987	44,477
2002	209,595	1,781	.	3,613	15,093	64,368	42,428
2003	208,017	x	.	3,416	x	65,604	40,412
2004	208,275	x	.	3,367	x	66,194	39,102
2005	199,521	x	.	2,901	x	63,965	36,866
2006	189,335	x	.	2,600	10,591	60,531	35,240
2007	178,365	x	.	x	x	55,612	31,413
persons							
	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories including Nunavut	
1993	1,656	1,167	10,478	69,590	.	.	.
1994	2,235	1,359	10,144	74,324	.	.	.
1995	2,304	1,502	10,918	71,274	.	.	.
1996	2,247	1,338	12,391	73,087	.	.	.
1997	2,409	1,620	12,759	70,836	.	.	.
1998	2,744	2,017	13,518	65,662	.	.	.
1999	2,958	1,787	14,395	69,431	.	.	.
2000	3,385	1,559	13,452	72,531	.	.	.
2001	4,451	1,554	13,600	61,843	.	.	.
2002	x	1,499	13,005	57,267	.	.	.
2003	x	1,379	12,502	58,421	.	.	.
2004	x	1,474	13,652	59,305	.	.	.
2005	x	1,460	14,293	56,663	.	.	.
2006	x	1,350	15,139	53,636	.	.	.
2007	x	x	15,075	53,025	.	.	.

1. Includes the following industries: forestry and logging; pulp, paper and paperboard mills; sawmills and wood preservation; and other wood product manufacturing.

Note(s): Data do not add up to Canada total because of unavailable data for some provinces or territories.

Source(s): CANSIM table 281-0024.

Table 3.29
Export of forest products

	Other crude wood products	Lumber	Other wood fabricated materials	Wood pulp and similar pulp	Newsprint paper	Other paper and paperboard	Total	Total as a share of Canadian exports
millions of dollars								
1987	467.4	5,937.6	1,095.1	5,473.9	6,028.7	1,944.1	20,946.8	16.7
1988	473.4	5,461.7	1,086.6	6,496.2	7,299.7	1,400.7	22,218.3	16.0
1989	438.3	5,590.6	1,060.4	6,940.8	6,507.1	1,753.2	22,290.4	16.1
1990	328.2	5,463.0	1,085.3	6,122.5	6,462.5	2,217.4	21,678.9	14.6
1991	283.0	5,225.5	965.8	4,937.5	6,499.1	2,215.0	20,125.9	13.8
1992	371.5	6,606.9	1,367.8	5,068.6	6,317.3	2,525.8	22,257.9	13.7
1993	389.3	9,514.8	1,787.3	4,640.9	6,656.8	2,812.5	25,801.6	13.8
1994	317.3	11,460.3	2,324.4	6,755.4	6,968.5	3,443.5	31,269.4	13.9
1995	339.2	10,966.3	2,735.0	10,938.3	9,480.1	4,785.1	39,244.0	15.0
1996	339.0	12,591.3	2,973.0	6,922.5	8,849.6	4,441.1	36,116.5	13.1
1997	324.7	13,080.7	3,486.9	6,917.4	7,958.3	4,711.1	36,479.1	12.2
1998	417.2	11,755.1	4,548.9	6,717.8	8,094.0	5,432.4	36,965.4	11.6
1999	528.9	13,413.9	5,965.1	7,468.0	8,254.7	5,780.9	41,411.5	11.7
2000	668.3	12,285.6	5,603.4	9,906.2	8,984.2	6,387.6	43,835.3	10.6
2001	667.8	11,703.3	5,384.5	7,356.0	9,294.5	6,356.1	40,762.2	10.1
2002	812.6	11,006.2	5,657.4	7,003.3	8,318.9	5,705.4	38,503.8	9.7
2003	701.9	9,070.3	6,363.2	6,878.2	7,360.5	4,961.6	35,335.7	9.3
2004	649.0	11,673.3	7,943.9	7,210.4	7,365.1	5,296.4	40,138.1	9.7
2005	759.2	10,568.1	7,262.0	6,328.7	7,471.9	5,099.3	37,489.2	8.6
2006	714.5	9,323.6	5,885.3	6,504.9	6,846.3	4,718.7	33,993.3	7.7

Note(s): Figures may not add up to totals due to rounding.

Source(s): CANSIM table 228-0003.

Table 3.30

Gross domestic product of mining and oil and gas extraction industries

Total gross domestic product	Mining and oil and gas extraction industries					Total	Share of total gross domestic product
	Oil and gas extraction	Coal mining	Metal ore mining	Non-metallic mineral mining and quarrying	Support activities for mining and oil and gas extraction		
millions of chained 2002 dollars							
1998	922,584	37,735	1,137	4,450	2,641	4,120	50,084
1999	974,405	37,926	1,118	4,285	3,122	3,665	50,116
2000	1,026,242	37,850	1,185	4,567	3,057	4,825	51,484
2001	1,040,943	37,188	1,321	4,301	3,276	5,274	51,360
2002	1,068,765	39,943	1,057	4,113	3,388	4,987	53,488
2003	1,091,378	40,618	794	4,003	4,091	5,571	55,077
2004	1,126,802	41,036	994	3,899	4,369	5,804	56,102
2005	1,160,024	40,651	991	3,930	4,296	6,635	56,503
2006	1,193,905	41,905	885	3,992	4,143	6,543	57,468
2007	1,224,319	43,172	980	3,994	4,883	5,484	58,513

Source(s): CANSIM table 379-0027.

Table 3.31
Employment in mining and oil and gas extraction industries by province and territory

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
	persons						
1992	135,330	.	.	.	3,395	15,067	23,039
1993	126,664	.	.	.	3,113	13,344	23,767
1994	135,304	.	.	.	2,966	13,052	21,413
1995	132,204	.	.	.	3,544	12,311	22,785
1996	128,240	.	.	.	3,606	11,872	22,723
1997	138,972	.	.	.	3,520	14,090	22,690
1998	138,040	.	.	.	3,373	14,066	20,066
1999	132,392	.	.	.	3,637	13,908	19,618
2000	136,269	.	.	.	3,840	14,064	18,872
2001	138,685	.	.	.	3,490	11,143	18,426
2002	139,841	.	.	.	3,004	11,649	17,312
2003	149,635	.	.	.	x	11,882	17,345
2004	155,307	.	.	.	x	11,839	18,976
2005	163,479	.	.	.	x	10,675	19,579
2006	182,564	.	.	.	x	11,938	21,268
	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories including Nunavut	
	persons						
1992	4,230	8,312	58,766	12,664	.	.	.
1993	3,992	8,106	54,546	10,542	.	.	.
1994	3,766	8,527	63,907	12,297	.	.	.
1995	3,442	9,992	58,743	13,061	.	.	.
1996	2,927	10,124	57,110	11,862	.	.	.
1997	3,762	10,910	63,173	12,781	.	.	.
1998	3,657	10,539	65,936	13,010	.	.	.
1999	2,854	10,254	63,813	10,665	.	.	.
2000	3,190	11,153	66,960	10,618	.	.	.
2001	2,720	11,334	73,614	10,546	.	.	.
2002	2,324	9,982	77,782	10,311	.	.	.
2003	x	10,191	86,032	10,517	.	.	.
2004	x	11,068	89,385	11,516	.	.	.
2005	2,391	12,645	95,434	12,638	.	.	.
2006	x	14,729	107,408	13,336	.	.	.

Note(s): Data do not add up to Canada total because of unavailable data for some provinces or territories.

Source(s): CANSIM table 281-0024.

Table 3.32
Gross domestic product of petroleum and coal products and selected primary metal manufacturing

Total gross domestic product	Petroleum and coal products manufacturing	Petroleum and coal products and selected primary metal manufacturing			Total	Share of total gross domestic product
millions of chained 2002 dollars						
1998	922,584	3,168	3,068	2,409	1,692	10,337
1999	974,405	3,049	3,071	2,561	1,763	10,444
2000	1,026,242	3,056	3,238	3,143	1,867	11,304
2001	1,040,943	3,423	2,679	3,231	2,196	11,528
2002	1,068,765	3,477	3,170	3,389	1,963	11,999
2003	1,091,378	3,477	2,932	3,283	1,845	11,537
2004	1,126,802	3,449	2,870	3,729	2,132	12,180
2005	1,160,024	3,351	2,805	4,090	2,059	12,305
2006	1,193,905	3,387	2,859	4,313	2,040	12,599
2007	1,224,319	3,283	2,912	4,283	1,996	12,474

Source(s): CANSIM table 379-0027.

Table 3.33
Production of leading minerals by province and territory, 2006^p

	Metallic minerals	Total production			Non-metallic minerals
		Fuels			
millions of dollars					
Canada	21,199.27	111,399.73			10,198.97
Newfoundland and Labrador	3,075.40	8,029.62			46.51
Prince Edward Island	0.00	0.00			3.91
Nova Scotia	0.00	x			x
New Brunswick	1,185.27	x			x
Quebec	3,213.43	0.00			1,515.06
Ontario	6,898.76	135.38			2,492.16
Manitoba	1,958.97	533.35			127.14
Saskatchewan	1,474.99	x			x
Alberta	1.30	x			x
British Columbia	3,297.81	10,045.42			672.67
Yukon Territory	37.66	28.19			5.44
Northwest Territories	55.66	563.15			1,573.34
Nunavut	0.00	0.00			29.20
Selected metallic minerals					
	Copper	Gold	Iron ore	Nickel	Silver
millions of dollars					
Canada	4,600.06	2,246.83	2,584.15	6,176.44	398.75
Newfoundland and Labrador	236.41	0.00	1,543.11	1,270.79	0.00
Prince Edward Island	0.00	0.00	0.00	0.00	0.00
Nova Scotia	0.00	0.00	0.00	0.00	0.00
New Brunswick	74.03	5.54	0.00	0.00	87.67
Quebec	144.60	508.30	x	628.13	74.22
Ontario	1,453.03	1,246.56	0.00	3,268.97	73.54
Manitoba	423.10	76.09	0.00	1,008.55	16.48
Saskatchewan	9.60	32.71	0.00	0.00	0.12
Alberta	0.00	1.30	0.00	0.00	0.00
British Columbia	2,259.29	338.84	x	0.00	146.55
Yukon Territory	0.00	37.49	0.00	0.00	0.18
Northwest Territories	0.00	0.00	0.00	0.00	0.00
Nunavut	0.00	0.00	0.00	0.00	0.00
Fuels					
	Coal	Crude petroleum	Natural gas ¹	Potash ²	Sand and gravel ^{3,4}
millions of dollars					
Canada	2,205.11	54,101.16	54,969.55	2,212.08	1,189.19
Newfoundland and Labrador	0.00	8,029.62	0.00	0.00	9.92
Prince Edward Island	0.00	0.00	0.00	0.00	x
Nova Scotia	x	317.44	1,077.21	0.00	x
New Brunswick	x	0.00	0.00	x	15.63
Quebec	0.00	0.00	0.00	0.00	89.86
Ontario	0.00	56.17	79.21	0.00	431.86
Manitoba	0.00	533.35	0.00	0.00	58.77
Saskatchewan	x	7,888.30	1,768.53	x	37.07
Alberta	x	36,014.47	44,509.95	0.00	306.81
British Columbia	1,649.95	798.82	7,406.29	0.00	203.72
Yukon Territory	0.00	0.00	28.19	0.00	5.44
Northwest Territories	0.00	462.99	100.16	0.00	5.81
Nunavut	0.00	0.00	0.00	0.00	0.00

1. Includes natural gas by-products.

2. Shipments of potash to Canadian potassium sulphate plants are not included in Northwest Territories.

3. Shipments of gypsum, silica, stone and sand and gravel to Canadian cement, lime and clay plants are not included in this table.

4. Mineral production of sand and gravel for Nunavut is included in Northwest Territories.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Manufacturing, Construction and Energy Division (MCED), Canada's Mineral Production, Preliminary Estimates, 2006, catalogue no. 26-202-X and MCED, special tabulation, unpublished data.

Table 3.34
Reserves of selected major metals

	Copper	Nickel	Lead	Zinc	Gold	Silver
thousands of tonnes						
1977	16,914	7,749	8,954	26,953	0.5	31
1978	16,184	7,843	8,930	26,721	0.5	31
1979	16,721	7,947	8,992	26,581	0.6	32
1980	16,714	8,348	9,637	27,742	0.8	34
1981	15,511	7,781	9,380	26,833	0.9	32
1982	16,889	7,546	9,139	26,216	0.8	31
1983	16,214	7,393	9,081	26,313	1.2	31
1984	15,530	7,191	9,180	26,000	1.2	31
1985	14,201	7,041	8,503	24,553	1.4	29
1986	12,918	6,780	7,599	22,936	1.5	26
1987	12,927	6,562	7,129	21,471	1.7	25
1988	12,485	6,286	6,811	20,710	1.8	26
1989	12,082	6,092	6,717	20,479	1.6	24
1990	11,261	5,776	5,643	17,847	1.5	20
1991	11,040	5,691	4,957	16,038	1.4	18
1992	10,755	5,605	4,328	14,584	1.3	16
1993	9,740	5,409	4,149	14,206	1.3	16
1994	9,533	5,334	3,861	14,514	1.5	19
1995	9,250	5,832	3,660	14,712	1.5	19
1996	9,667	5,623	3,450	13,660	1.7	19
1997	9,032	5,122	2,344	10,588	1.5	17
1998	8,402	5,683	1,845	10,159	1.4	16
1999	7,763	4,983	1,586	10,210	1.3	15
2000	7,419	4,782	1,315	8,876	1.1	14
2001	6,666	4,335	970	7,808	1.1	13
2002	6,774	4,920	872	6,871	1	11
2003	6,037	4,303	749	6,251	1	9
2004	5,546	3,846	667	5,299	0.8	7
2005	6,589	3,960	552	5,063	1.0	7

Source(s): Natural Resources Canada, 2005, Canadian Minerals Yearbook, http://www.nrcan.gc.ca/mms/cmy/pref_e.htm (accessed July 4, 2007).

Table 3.35
Annual production¹ of metals and non-fuel minerals

	Copper	Nickel	Lead	Zinc	Iron ore	Gold	Potash	Salt	Gypsum
thousands of tonnes									
1950	240	112	150	284	3,271	0.14	..	779	3,325
1951	245	125	144	309	4,246	0.14	..	875	3,450
1952	234	127	153	337	4,783	0.14	..	882	3,255
1953	230	130	176	364	5,906	0.13	..	866	3,483
1954	274	146	198	342	6,678	0.14	..	880	3,584
1955	296	159	184	393	14,772	0.14	..	1,129	4,234
1956	322	162	171	384	20,274	0.14	..	1,443	4,440
1957	326	170	165	375	20,205	0.14	..	1,607	4,151
1958	313	126	169	386	14,267	0.14	..	2,155	3,596
1959	358	169	169	359	22,215	0.14	..	2,985	5,335
1960	398	195	186	369	19,550	0.14	..	3,007	4,722
1961	398	211	209	377	18,469	0.14	..	2,945	4,478
1962	415	211	195	420	24,820	0.13	..	3,301	4,836
1963	416	200	184	424	27,300	0.12	..	3,377	5,409
1964	444	207	185	611	34,857	0.12	..	3,618	5,770
1965	462	242	268	747	36,181	0.11	1,335	4,159	5,718
1966	461	203	276	872	36,914	0.10	1,979	3,746	5,421
1967	547	224	285	994	37,788	0.09	2,389	4,532	4,549
1968	574	240	309	1,052	43,040	0.09	2,576	4,413	5,378
1969	520	194	289	1,096	36,337	0.08	3,161	4,199	5,782
1970	610	278	353	1,136	47,458	0.07	3,108	4,919	5,733
1971	654	267	368	1,134	42,957	0.07	3,558	5,061	6,081
1972	720	235	335	1,129	38,736	0.06	3,495	4,902	7,349
1973	824	249	342	1,227	47,498	0.06	4,454	5,047	7,610
1974	821	269	294	1,127	46,784	0.05	5,776	5,447	7,226
1975	720	240	315	1,004	44,742	0.05	4,726	5,123	5,746
1976	731	241	256	982	55,416	0.05	5,215	5,994	6,003
1977	759	232	281	1,071	53,621	0.05	5,764	6,039	7,231
1978	659	128	320	1,067	42,931	0.05	6,344	6,452	8,074
1979	636	126	311	1,100	59,617	0.05	7,074	6,881	8,099
1980	710	188	280	920	50,224	0.05	7,225	7,226	7,285
1981	691	160	268	911	49,551	0.05	6,549	7,239	7,025
1982	612	89	272	966	33,198	0.06	5,309	7,930	5,986
1983	653	125	272	988	32,959	0.07	6,294	8,602	7,507
1984	722	174	264	1,063	39,930	0.08	7,527	10,235	7,775
1985	739	170	268	1,049	39,502	0.09	6,661	10,085	7,761
1986	699	164	334	988	36,167	0.10	6,753	10,740	8,802
1987	794	189	373	1,158	37,804	0.12	7,668	10,129	9,095
1988	758	199	351	1,370	39,934	0.13	8,154	10,687	9,513
1989	704	196	269	1,273	39,445	0.16	7,014	11,158	8,195
1990	771	195	233	1,179	35,670	0.17	7,345	11,191	7,977
1991	780	188	248	1,083	35,917	0.18	7,087	11,871	6,729
1992	762	178	340	1,196	32,137	0.16	7,040	11,088	7,293
1993	711	178	183	991	33,774	0.15	6,880	10,993	7,564
1994	591	142	168	976	36,728	0.15	8,517	12,244	8,586
1995	701	172	204	1,095	37,024	0.15	8,855	10,957	8,055
1996	652	182	242	1,163	34,709	0.16	8,120	12,248	8,201
1997	648	181	171	1,027	39,293	0.17	9,235	13,497	8,628
1998	691	198	150	992	36,847	0.16	8,884	13,034	8,307
1999	582	177	155	963	33,990	0.16	8,475	12,686	9,347
2000	622	181	143	936	35,247	0.15	9,033	12,164	8,572
2001	614	184	150	1,012	27,119	0.16	8,237	13,725	7,820
2002	584	180	101	924	30,902	0.15	8,361	12,736	8,810
2003	541	155	93	757	33,322	0.14	9,229	13,718	8,380
2004	544	177	73	734	28,596	0.13	10,332	14,096	9,204
2005	577	193	73	619	30,386	0.12	10,140	13,463	8,569
2006	586	225	79	601	33,543	0.10	8,518	14,460	9,036
2007	580	246	70	587	32,834	0.10	11,112	11,968	7,583

1. Refers to the recoverable metal in concentrates shipped, with the exception of iron ore where the quantity of ore mined is the determining factor.
Source(s): CANSIM tables 152-0001 and 152-0004.

Table 3.36
Primary energy consumption indicators¹

	Population	Gross domestic product	Primary energy ¹	Energy consumption per capita	Energy consumption per dollar of real gross domestic product
	millions	millions of chained 2002 dollars	terajoules	gigajoule per person	megajoule per dollars chained 2002
1980	24,516,071	625,414	8,214,887	335.1	13.1
1981	24,820,393	647,323	7,862,627	316.8	12.1
1982	25,117,442	628,816	7,381,457	293.9	11.7
1983	25,366,969	645,906	7,299,903	287.8	11.3
1984	25,607,651	683,462	7,737,547	302.2	11.3
1985	25,842,736	716,132	7,908,762	306.0	11.0
1986	26,101,155	733,468	7,834,444	300.2	10.7
1987	26,448,855	764,664	8,122,249	307.1	10.6
1988	26,795,383	802,702	8,660,052	323.2	10.8
1989	27,281,795	823,728	8,945,237	327.9	10.9
1990	27,697,530	825,318	9,229,938	333.2	11.2
1991	28,031,394	808,051	9,090,962	324.3	11.3
1992	28,366,737	815,123	9,176,260	323.5	11.3
1993	28,681,676	834,185	9,314,103	324.7	11.2
1994	28,999,006	874,261	9,564,313	329.8	10.9
1995	29,302,091	898,814	9,695,204	330.9	10.8
1996	29,610,757	913,364	10,097,156	341.0	11.1
1997	29,907,172	951,962	10,200,117	341.1	10.7
1998	30,157,082	990,968	10,194,873	338.1	10.3
1999	30,403,878	1,045,786	10,518,257	346.0	10.1
2000	30,689,035	1,100,515	10,830,985	352.9	9.8
2001	31,021,251	1,120,146	10,950,393	353.0	9.8
2002	31,372,587	1,152,905	11,163,501	355.8	9.7
2003	31,676,077	1,174,592	11,478,526	362.4	9.8
2004	31,995,199	1,210,656	11,527,500	360.3	9.5
2005	32,312,077	1,247,780	11,307,113	349.9	9.1
2006	32,649,482	1,282,204	11,216,025	343.5	8.7

1. Defined as the amount that was available for use in the Canadian economy. Includes the use of energy resources for non-energy purposes (for example, petrochemical feedstocks in fertilizer production). Excludes the use of wood and wastes as energy sources.

Source(s): CANSIM tables 128-0002, 128-0009, 051-0001 and 380-0017

Table 3.37

Production and consumption¹ of primary energy resources

	Total coal		Crude oil		Natural gas ²		Electricity ³		Total	
	Production	Availability	Production	Availability	Production	Availability	Production	Availability	Production	Availability
terajoules										
1980	891,070	928,409	3,444,041	4,216,120	3,180,730	2,116,374	1,052,072	953,991	8,567,913	8,214,894
1981	969,542	947,942	3,093,450	3,911,507	3,080,003	2,010,520	1,114,624	992,669	8,257,619	7,862,638
1982	1,028,279	1,001,681	3,052,121	3,359,122	3,163,161	2,040,386	1,093,191	980,277	8,336,752	7,381,466
1983	1,066,011	1,048,015	3,232,271	3,201,037	2,980,532	2,027,274	1,150,257	1,020,347	8,429,071	7,296,673
1984	1,396,400	1,167,377	3,430,899	3,183,745	3,311,332	2,292,108	1,235,057	1,094,325	9,373,688	7,737,555
1985	1,487,132	1,122,086	3,516,525	3,085,568	3,622,687	2,532,461	1,313,821	1,168,658	9,940,165	7,908,773
1986	1,382,118	1,039,979	3,531,205	3,055,190	3,458,952	2,480,595	1,381,010	1,258,688	9,753,285	7,834,452
1987	1,393,936	1,117,744	3,690,859	3,172,058	3,766,024	2,574,349	1,416,413	1,258,110	10,267,232	8,122,261
1988	1,614,195	1,200,307	3,877,941	3,359,461	4,313,054	2,809,862	1,390,669	1,290,430	11,195,859	8,660,060
1989	1,718,400	1,197,786	3,769,304	3,423,980	4,552,627	3,025,526	1,331,644	1,297,953	11,371,975	8,945,245
1990	1,673,101	1,136,171	3,765,187	3,874,090	4,574,109	2,899,032	1,321,912	1,320,656	11,334,309	9,229,949
1991	1,747,976	1,099,786	3,765,443	3,726,587	4,805,528	2,922,760	1,408,181	1,341,838	11,727,128	9,090,971
1992	1,553,530	1,120,353	3,931,692	3,615,091	5,298,028	3,116,689	1,414,322	1,324,135	12,197,572	9,176,268
1993	1,651,313	994,715	4,116,941	3,741,690	5,832,901	3,196,872	1,479,535	1,380,835	13,080,690	9,314,112
1994	1,735,269	1,054,689	4,299,874	3,808,804	6,331,888	3,312,684	1,546,239	1,388,145	13,913,270	9,564,322
1995	1,800,811	1,056,083	4,457,769	3,801,848	6,711,568	3,434,306	1,532,656	1,402,976	14,502,804	9,695,213
1996	1,832,286	1,099,131	4,590,726	3,984,463	6,932,462	3,563,509	1,585,629	1,450,067	14,941,103	10,097,170
1997	1,897,322	1,168,601	4,842,646	4,087,294	7,012,563	3,540,975	1,531,890	1,403,258	15,284,421	10,200,128
1998	1,651,482	1,287,709	5,021,730	4,090,494	7,269,299	3,488,847	1,426,237	1,327,829	15,368,748	10,194,879
1999	1,589,310	1,278,044	4,788,758	4,167,500	7,498,476	3,695,016	1,481,669	1,377,703	15,358,213	10,518,263
2000	1,509,905	1,330,940	4,999,607	4,251,781	7,734,303	3,852,022	1,524,557	1,396,249	15,768,372	10,830,992
2001	1,532,994	1,421,952	5,056,168	4,388,726	7,857,807	3,775,073	1,447,914	1,364,650	15,894,883	10,950,401
2002	1,429,897	1,322,247	5,359,627	4,454,025	7,876,101	3,955,247	1,505,333	1,431,988	16,170,958	11,163,507
2003	1,326,114	1,398,121	5,679,573	4,631,977	7,708,115	4,015,753	1,457,123	1,432,678	16,170,925	11,478,529
2004	1,415,738	1,252,140	5,869,418	4,762,714	7,746,364	4,029,335	1,522,225	1,483,313	16,553,745	11,527,502
2005	1,400,510	1,326,344	5,632,426	4,507,267	7,848,271	3,950,690	1,608,679	1,522,814	16,489,886	11,307,115
2006	1,339,754	1,295,056	5,935,706	4,457,607	7,921,087	3,932,688	1,599,479	1,530,676	16,796,026	11,216,027

1. Defined as the amount that was available for use in the Canadian economy. Includes the use of energy resources for non-energy purposes (for example, petrochemical feedstocks in fertilizer production). Excludes the use of wood and wastes as energy sources.

2. Includes natural gas liquids (ethane, butane, propane and pentanes plus).

3. Includes primary steam.

Source(s): CANSIM tables 128-0002 and 128-0009.

Table 3.38
Established energy resource reserves

Coal 1		Crude oil		Crude bitumen		Natural gas 2		Uranium	
Reserves	Reserve life	Reserves	Reserve life	Reserves	Reserve life	Reserves	Reserve life	Reserves	Reserve life
megatonnes	years	millions of cubic metres	years	millions of cubic metres	years	billions of cubic metres	years	kilotonnes	years
1976	4,310.70	169	1,014.60	14	150.7	40	1,738.1	26	405
1977	4,117.00	144	969.1	13	111.2	33	1,790.2	25	415
1978	4,092.60	134	942.7	13	321.5	68	1,911.2	25	438
1979	4,021.80	121	903.3	11	353.1	48	1,977.0	24	468
1980	4,192.50	114	860.7	11	333.9	32	2,028.3	28	444
1981	4,159.90	104	827.8	12	325	37	2,084.8	27	340
1982	5,704.00	133	780.6	12	315.6	34	2,147.7	31	376
1983	5,981.00	134	792.4	12	310.4	18	2,125.9	29	333
1984	6,120.60	107	776.3	11	328.8	28	2,106.1	27	260
1985	6,011.80	99	790.5	11	343.4	22	2,079.8	25	263
1986	6,338.90	110	774.6	11	574.4	30	2,032.1	26	265
1987	6,583.50	108	753.6	11	572.5	28	1,955.3	25	258
1988	6,542.30	93	739.2	10	566.5	26	1,931.2	19	248
1989	6,472.60	92	707.8	10	542.2	23	1,957.1	19	249
1990	6,580.70	96	657.3	10	524	23	1,978.6	18	295
1991	6,545.20	92	614.9	9	501.7	22	1,965.2	20	305
1992	6,522.10	99	590.4	8	482.2	20	1,929.1	15	309
1993	6,449.40	93	582.2	7	457.6	19	1,859.9	13	313
1994	6,372.20	88	544.5	7	565	24	1,832.7	13	300
1995	6,293.40	84	553	7	574	20	1,840.9	12	484
1996	6,210.70	82	526.7	7	660.8	24	1,725.9	11	430
1997	6,132.00	78	532.2	7	614	19	1,620.4	10	419
1998	6,056.90	81	673.5	8	1,336.00	35	1,562.2	10	433
1999	5,502.10	76	642.5	8	1,891.10	53	1,526.8	9	417
2000	4,722.80	68	667.3	8	1,860.00	48	1,614.5	9	437
2001	4,555.30	67	644.7	8	1,830.00	44	1,547.8	9	452
2002	4,485.30	66	606.1	7	1,840.00	38	1,529.6	9	439
2003	4406.4	71	590	7	1,720.00	31	1,469.5	9	429
2004	4666.3	66	603.8	8	1,660.00	26	1,497.5	9	444
2005	4,468.8	66	752.3	10	1,620.0	28	1,553.7	9	431
2006	4,399.9	63	712.6	9	3,340.0	51	1,577.7	9	423

1. Includes bituminous, sub-bituminous and lignite coal.

2. Includes natural gas liquids (ethane, butane, propane and pentanes plus).

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM tables 153-0012, 153-0013, 153-0014, 153-0017, 153-0018 and 153-0019.

Table 3.39

Installed capacity and generated electricity by province and territory, 2005

	Installed generating capacity ¹				Total
	Hydroelectric energy	Thermal-electric energy ²	Nuclear energy	Wind and tidal energy	
megawatts					
Canada	71,978	35,471	13,345	688	121,482
Newfoundland and Labrador	6,777	717	0	0	7,494
Prince Edward Island	0	158	0	14	171
Nova Scotia	404	2,009	0	40	2,452
New Brunswick	930	2,884	680	0	4,494
Quebec	35,982	1,920	675	212	38,790
Ontario	8,473	11,779	11,990	15	32,257
Manitoba	5,024	501	0	20	5,545
Saskatchewan	855	2,907	0	112	3,873
Alberta	879	10,197	0	275	11,351
British Columbia	12,545	2,203	0	0	14,748
Yukon Territory	77	31	0	1	109
Northwest Territories and Nunavut	32	166	0	0	198
Generation					
	Hydroelectric energy	Thermal-electric energy ²	Nuclear energy	Wind and tidal energy	Total electric energy
megawatt hours					
Canada	358,446,082	157,514,564	86,829,896	1,709,361	604,499,903
Newfoundland and Labrador	40,498,238	1,638,113	0	0	42,136,351
Prince Edward Island	0	6,313	0	40,104	46,417
Nova Scotia	1,075,368	11,288,467	0	113,088	12,476,923
New Brunswick	3,875,332	12,809,735	4,377,987	0	21,063,054
Quebec	173,356,235	2,040,553	4,483,055	416,241	180,296,084
Ontario	35,479,841	45,276,098	77,968,854	155,596	158,880,389
Manitoba	36,439,655	556,334	0	53,420	37,049,409
Saskatchewan	4,572,910	15,355,630	0	91,916	20,020,456
Alberta	2,241,937	60,556,232	0	838,106	63,636,275
British Columbia	60,327,016	7,446,654	0	0	67,773,670
Yukon Territory	320,443	22,416	0	890	343,749
Northwest Territories and Nunavut	259,107	518,019	0	0	777,126

1. Nameplate rating in megawatts.

2. Includes steam, internal combustion and combustion turbines.

Source(s): Statistics Canada, Manufacturing, Construction and Energy Division; Electric Power Generation, Transmission and Distribution, 2005, catalogue no. 57-202-X.

Table 3.40
Hydro-electric power generation by province and territory

	1997			2007		
	Total hydro generation	Overall total generation	Hydro as share of total	Total hydro generation	Overall total generation	Hydro as share of total
	megawatt hours	percent		megawatt hours	percent	
Canada	345,302,715	554,439,704	62.3	364,504,258	603,181,896	60.4
Newfoundland and Labrador	40,176,738	41,748,738	96.2	40,045,435	41,608,329	96.2
Prince Edward Island		20,928			112,682	
Nova Scotia	976,173	10,494,153	9.3	1,041,343	12,513,869	8.3
New Brunswick	2,329,026	16,699,594	13.9	2,754,827	16,897,065	16.3
Quebec	160,554,393	165,997,286	96.7	179,552,320	186,045,674	96.5
Ontario	39,575,725	146,651,617	27.0	35,110,806	157,947,499	22.2
Manitoba	33,481,866	33,749,382	99.2	33,544,384	34,142,111	98.2
Saskatchewan	3,986,385	16,877,522	23.6	4,933,915	20,008,845	24.7
Alberta	1,898,993	54,046,699	3.5	2,089,564	60,504,171	3.5
British Columbia	61,772,188	66,961,301	92.3	64,738,377	72,211,656	89.7
Yukon Territory	259,153	376,432	68.8	331,039	354,694	93.3
Northwest Territories including						
Nunavut	292,075	816,052	35.8	..	..	..
Northwest Territories	..	..	..	250,246	686,595	36.4
Nunavut	..	..	..	0	148,706	0.0

Note(s): Figures may not add up to totals due to rounding.

Source(s): CANSIM table 127-0001.

Table 3.41
Energy consumed in thermal-electric power stations by fuel type

	Coal				Fuel oil		Natural gas	Wood
	Canadian bituminous	Imported bituminous	Canadian sub-bituminous	Imported sub-bituminous	Lignite	Heavy	Light and diesel	
terajoules								
1980	108,955	249,422	183,478	..	77,541	105,286	12,619	71,159
1981	123,737	261,758	196,493	..	83,624	70,106	11,105	51,057
1982	114,238	283,650	227,007	..	102,310	77,043	10,724	42,124
1983	126,315	279,586	254,165	..	121,137	45,627	9,559	33,454
1984	139,267	297,373	290,931	..	131,173	42,030	9,210	23,619
1985	145,449	227,090	317,016	..	134,416	47,958	9,104	23,259
1986	119,666	188,934	321,289	..	117,393	43,598	9,175	17,316
1987	151,508	229,026	340,572	..	142,376	75,702	9,987	20,619
1988	162,522	244,213	364,652	..	170,660	99,195	8,504	40,419
1989	163,602	245,290	369,774	..	155,005	154,053	12,136	102,753
1990	150,746	183,215	384,276	..	134,968	137,048	12,158	50,530
1991	170,019	212,996	430,106	..	131,390	112,131	11,813	41,525
1992	159,353	195,313	392,792	..	141,328	132,502	10,346	99,820
1993	141,190	118,909	436,468	..	144,378	93,734	11,104	126,992
1994	123,014	131,018	478,936	..	150,410	70,834	9,909	154,846
1995	122,419	146,541	477,598	..	153,209	79,934	11,088	149,890
1996	132,402	169,149	458,122	..	159,646	61,305	10,418	105,074
1997	112,114	216,821	475,008	22,193	169,137	99,336	8,691	154,899
1998	90,160	281,115	468,503	40,004	177,657	147,675	8,015	200,450
1999	84,148	300,861	445,127	63,881	170,501	119,554	7,782	204,930
2000	47,231	381,795	437,491	126,800	166,262	108,955	7,632	273,301
2001	51,580	351,178	450,912	140,385	169,140	127,541	8,172	333,946
2002	45,823	305,444	465,280	143,415	166,599	111,800	7,178	278,613
2003	40,062	309,723	463,203	139,640	167,154	137,307	8,540	241,835
2004	115,245	249,906	371,637	107,083	169,817	131,109	8,760	267,009
2005	70,588	252,126	408,500	141,558	160,482	112,317	8,743	307,598

Source(s): Statistics Canada, Manufacturing, Construction and Energy Division; Electric Power Generation, Transmission and Distribution, catalogue no. 57-202-X, various issues.

Energy generation in thermal-electric power stations by fuel type

	Coal					Fuel oil		Natural gas	Wood
	Canadian bituminous	Imported bituminous	Canadian sub-bituminous	Imported sub-bituminous	Lignite	Heavy	Light and diesel		
terajoules									
1980	34,102	89,540	58,612	..	21,133	34,564	3,102	19,175	..
1981	36,693	92,867	62,547	..	22,972	22,451	3,256	13,097	..
1982	37,070	100,930	71,820	..	27,892	25,852	3,062	11,030	..
1983	40,109	100,592	80,439	..	33,222	14,658	2,791	8,615	..
1984 ¹	46,928	106,065	90,662	..	38,555	13,554	2,735	5,777	..
1985	48,576	80,331	98,869	..	38,025	15,419	2,710	5,773	..
1986 ¹	42,038	69,406	109,398	..	36,947	15,385	2,865	4,349	..
1987 ¹	53,808	84,830	116,663	..	45,297	27,065	2,995	5,649	..
1988 ¹	58,411	90,953	125,044	..	52,989	35,833	2,463	11,727	..
1989 ¹	58,285	91,097	123,637	..	48,603	54,493	3,913	32,494	..
1990 ¹	53,613	66,888	132,608	..	42,661	49,113	3,715	14,887	..
1991 ¹	57,684	74,519	139,965	..	40,808	39,965	3,434	12,327	..
1992 ¹	56,474	71,853	145,984	..	44,792	46,861	3,193	30,620	..
1993 ¹	50,148	42,944	150,070	..	46,265	33,537	3,541	42,180	..
1994	41,040	44,603	152,382	..	44,731	23,307	3,097	45,040	..
1995	41,244	49,124	152,976	..	45,861	26,223	3,895	52,634	..
1996	44,809	58,752	148,520	..	46,909	19,591	3,327	35,011	..
1997	38,510	76,698	153,122	7,745	49,155	33,222	2,724	54,897	..
1998	30,623	104,460	152,275	13,959	52,801	48,659	2,581	69,600	5,987
1999	28,498	107,224	145,601	22,418	49,652	39,708	2,367	72,474	6,055
2000	14,770	132,830	143,509	42,042	49,995	36,002	2,159	95,844	6,590
2001	16,727	115,049	146,051	40,027	50,929	42,052	2,398	114,738	7,313
2002	13,844	103,636	152,767	47,306	50,257	37,481	2,111	100,130	7,487
2003	11,545	102,218	148,987	48,595	54,613	45,977	2,624	85,489	7,613
2004	38,262	84,545	119,995	34,758	53,518	43,709	2,691	94,532	6,842
2005	22,696	85,370	133,213	46,676	50,056	36,827	2,680	110,699	6,412

1. The years 1984 and 1986 to 1993 are gross generation, which means that station service was not deducted to calculate net generation.

Source(s): Statistics Canada, Manufacturing, Construction and Energy Division; Electric Power Generation, Transmission and Distribution, catalogue no. 57-202-X.

Table 3.43

Efficiency¹ of thermal-electric power stations by fuel type

	Coal				Lignite	Fuel oil		Natural gas	Wood
	Canadian bituminous	Imported bituminous	Canadian sub-bituminous	Imported sub-bituminous		Heavy	Light and diesel		
percent									
1980	31	36	32	..	27	33	25	27	
1981	30	35	32	..	27	32	29	26	
1982	32	36	32	..	27	34	29	26	
1983	32	36	32	..	27	32	29	26	
1984	34	36	31	..	29	32	30	24	
1985	33	35	31	..	28	32	30	25	
1986	35	37	34	..	31	35	31	25	
1987	36	37	34	..	32	36	30	27	
1988	36	37	34	..	31	36	29	29	
1989	36	37	33	..	31	35	32	32	
1990	36	37	35	..	32	36	31	29	
1991	34	35	33	..	31	36	29	30	
1992	35	37	37	..	32	35	31	31	
1993	36	36	34	..	32	36	32	33	
1994	33	34	32	..	30	33	31	29	
1995	34	34	32	..	30	33	35	35	
1996	34	35	32	..	29	32	32	33	
1997	34	35	32	35	29	33	31	35	
1998	34	37	33	35	30	33	32	35	40
1999	34	36	33	35	29	33	30	35	35
2000	31	35	33	33	30	33	28	35	31
2001	32	33	32	29	30	33	29	34	27
2002	30	34	33	33	30	34	29	36	27
2003	29	33	32	35	33	33	31	35	30
2004	33	34	32	32	32	33	31	35	19
2005	32	34	33	33	31	33	31	36	24

1. Efficiency is the electrical energy output as a percentage of primary energy input.

Source(s): Statistics Canada, Manufacturing, Construction and Energy Division; Electric Power Generation, Transmission and Distribution, catalogue no. 57-202-X.

Table 3.44

Top ten substances released to air, 2005

	Releases	Share of total	
		tonnes	percent
Sulphur dioxide	1,857,814.8		41.8
Carbon monoxide	1,026,669.8		23.1
Oxides of nitrogen (expressed as NO ₂)	841,367.1		18.9
Volatile organic compounds (VOCs)	262,126.4		5.9
Total particulate matter (TPM)	175,080.3		3.9
Ammonia (total) ¹	20,203.1		0.5
Methanol	16,470.8		0.4
Sulphuric acid	11,041.5		0.2
Hydrochloric acid	8,106.3		0.2
Xylene (all isomers)	5,955.0		0.1

1. Refers to the total of both ammonia (NH₃) and ammonium ion (NH₄⁺) in solution.Source(s): Environment Canada, Pollution Data Branch, 2007, National Pollutant Release Inventory Database, http://www.ec.gc.ca/pdb/npri/npri_prev_data_e.cfm (accessed September 24, 2007).

Table 3.45
Criteria air contaminant emissions, 2005

	Particulate matter 1			SO _x ⁴	NO _x ⁵	VOC ⁶	CO
	Total	PM ₁₀ ²	PM _{2.5} ³				
tonnes							
Industrial sources							
Abrasives manufacture	20	17	7	8	2	30	5
Aluminum industry	9,698	5,895	4,092	62,022	1,041	1,689	392,680
Asbestos industry	43	24	9	230	86	1	60
Asphalt paving industry	49,720	7,462	2,488	24	12	7	821
Bakeries	1	0	0	0	0	6,398	0
Cement and concrete industry	52,668	18,345	8,796	44,869	45,924	407	21,712
Chemicals industry	3,472	1,925	1,304	25,106	22,091	4,652	11,382
Clay products industry	92	55	21	196	34	1	59
Coal mining industry	10,398	5,297	2,666	3,467	2,094	1,105	70
Ferrous foundries	6,039	5,623	5,113	1,365	324	728	48,870
Grain industries	39,057	9,726	2,010	0	0	0	0
Iron and steel industries	9,043	5,360	4,056	29,177	12,406	2,572	54,131
Iron ore mining industry	9,506	5,213	1,936	18,986	12,759	1,594	23,038
Mining and rock quarrying	133,280	14,272	4,414	2,013	12,186	1,228	4,272
Non-ferrous mining and smelting industry	10,757	8,093	5,421	669,967	3,778	46	12,574
Oil sands	5,582	3,977	2,450	147,357	71,178	58,805	67,858
Other petroleum and coal products industry	29	24	16	780	513	1,042	210
Paint and varnish manufacturing	46	41	29	0	9	3,039	1
Petrochemical industry	772	728	229	190	5,566	3,862	3,656
Petroleum refining	6,676	5,356	3,647	98,518	31,204	15,188	20,290
Plastics and synthetic resins fabrication	202	189	128	64	229	2,743	294
Pulp and paper industry	29,321	21,053	14,891	62,106	44,932	22,181	92,099
Upstream oil and gas industry	9,087	9,029	8,996	202,210	461,540	493,755	441,914
Wood industry	74,874	45,176	19,302	2,437	11,282	47,259	273,990
Other industries	62,935	38,174	25,073	48,426	65,195	66,829	33,386
Subtotal, industrial sources	523,317	211,053	117,095	1,419,520	804,382	735,157	1,503,371
Non-industrial fuel combustion							
Commercial fuel combustion	4,405	3,795	2,957	36,629	34,498	2,058	20,105
Electric power generation (utilities)	33,617	15,554	7,996	519,835	244,692	1,975	35,682
Residential fuel combustion	3,348	2,762	2,526	11,357	35,088	1,723	13,147
Residential fuel wood combustion	111,885	105,919	105,795	1,466	10,263	152,883	690,409
Subtotal, non-industrial fuel combustion	153,255	128,030	119,275	569,287	324,540	158,640	759,343
Transportation							
Air transportation	1,022	1,022	998	4,360	62,223	10,077	60,626
Heavy-duty diesel vehicles	7,422	7,422	6,862	6,052	276,167	10,270	58,221
Heavy-duty gasoline trucks	372	362	300	76	25,753	8,413	130,129
Light-duty diesel trucks	504	504	465	388	4,899	2,058	3,764
Light-duty diesel vehicles	158	158	145	107	1,405	447	1,725
Light-duty gasoline trucks	776	753	610	653	114,481	125,904	2,187,142
Light-duty gasoline vehicles	501	486	446	611	105,011	123,025	1,989,236
Marine transportation	5,820	5,820	5,565	32,360	117,096	8,035	9,572
Motor cycles	24	23	16	3	1,539	3,622	18,859
Off-road use of diesel	36,004	36,004	34,923	16,436	368,194	38,798	188,626
Off-road use of gasoline/LPG/CNG	8,384	8,384	7,727	98	50,490	260,170	2,419,537
Rail transportation	4,029	4,029	3,706	5,180	117,170	2,971	16,003
Tire wear and brake lining	4,942	4,886	1,704	0	0	0	0
Subtotal, transportation	69,956	69,852	63,468	66,321	1,244,428	593,788	7,083,438
Incineration							
Crematorium	5	5	5	6	36	2	17
Industrial and commercial incineration	106	70	41	280	254	613	951
Municipal incineration	832	539	312	340	1,451	731	1,938
Other incineration and utilities	435	286	241	2,109	2,342	737	5,244
Subtotal, incineration	1,376	899	599	2,736	4,083	2,082	8,150
Miscellaneous							
Cigarette smoking	520	520	520	0	0	9	2,459
Dry cleaning	1	1	1	0	0	185	0
Fuel marketing	11	8	5	135	27	97,635	2
General solvent use	0	0	0	0	0	239,544	0
Marine cargo handling industry	1,317	652	182	0	0	0	0
Meat cooking	7,980	7,980	7,980	0	0	0	0
Pesticides and fertilizer application	10,708	5,247	1,499	0	0	0	0

See footnotes at the end of the table.

Table 3.45 – continued

Criteria air contaminant emissions, 2005

	Particulate matter ¹			SO _x ⁴	NO _x ⁵	VOC ⁶	CO
	Total	PM ₁₀ ²	PM _{2.5} ³				
tonnes							
Printing	3	3	2	0	25	41,602	21
Structural fires	273	273	253	0	0	278	1,518
Surface coatings	0	0	0	0	0	66,391	0
Subtotal, miscellaneous	20,813	14,684	10,442	135	52	445,644	3,999
Open sources							
Agriculture (animals)	314,979	201,587	31,498	0	0	300,548	0
Agriculture (tilling and wind erosion)	1,797,559	877,653	24,532	0	0	0	0
Construction operations	3,238,447	971,556	194,318	75	14	46	22
Dust from paved roads	3,182,881	610,053	145,952	0	0	0	0
Dust from unpaved roads	7,985,814	2,529,410	377,040	0	0	0	0
Forest fires	246,206	209,277	172,345	147	64,593	278,068	2,027,582
Landfills sites	3,134	483	205	20	1,099	13,171	3,551
Mine tailings	32,966	2,637	659	0	0	0	0
Prescribed burning	2,565	2,498	2,398	136	853	4,175	14,903
Subtotal, open sources	16,804,552	5,405,155	948,947	378	66,559	596,008	2,046,058
Grand total	17,573,269	5,829,673	1,259,826	2,058,375	2,444,044	2,531,319	11,404,359

1. Total particulate matter is made up of solid and liquid particles under 100 micrometres in diameter that are released into the atmosphere.

2. PM₁₀ is the fraction of total particulate matter that is less than or equal to 10 micrometres in diameter.

3. PM_{2.5} is the fraction of total particulate matter that is less than or equal to 2.5 micrometres in diameter.

4. SO_x is made up of gaseous oxides of sulphur, mainly sulphur dioxide (SO₂). In some cases, emissions may contain small amounts of sulphur trioxide (SO₃) and sulphurous and sulphuric acid vapour.

5. NO_x is made up of gaseous nitric oxide (NO) and nitrogen dioxide (NO₂).

6. Volatile organic compounds (VOCs) are made up of photochemically reactive hydrocarbon compounds (i.e., those that participate in chemical reactions when exposed to sunlight). They are major contributors to smog in urban areas.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Environment Canada, Pollution Data Branch, 2007, Criteria Air Contaminant Emission Summaries,

http://www.ec.gc.ca/pdb/cac/Emissions1990-2015/emissions_e.cfm (accessed January 22, 2008).

Table 3.46
Greenhouse gas (GHG) emissions by source and sink category

	Carbon dioxide (CO ₂)		Methane (CH ₄)		Nitrous oxide (N ₂ O)		CO ₂ -equivalents ¹		
	1990	2005	1990	2005	1990	2005	1990	2005	Percentage change 1990 to 2005
kilotonnes									
Energy	428,000	544,000	1,700	2,600	30	30	473,000	609,000	28.8
Stationary combustion sources	276,000	338,000	200	200	7	8	282,000	346,000	22.7
Electricity and heat generation	94,700	128,000	1.8	5.1	2	2	95,300	129,000	35.4
Fossil fuel industries	49,600	70,400	80	100	1	2	52,000	73,000	40.4
Petroleum refining and upgrading	16,000	18,000	...	...	0.3	0.4	16,000	18,000	12.5
Fossil fuel production	34,100	52,000	80	100	0.7	1	36,000	55,000	52.8
Mining	6,140	15,500	0.1	0.3	0.1	0.4	6,180	15,600	152.4
Manufacturing industries	54,200	45,400	3	3	2	2	54,700	45,900	-16.1
Iron and steel	6,420	6,460	0.2	0.2	0.2	0.2	6,490	6,520	0.5
Non ferrous metals	3,170	3,170	0.07	0.07	0.05	0.05	3,180	3,190	0.3
Chemical	7,050	5,320	0.15	0.11	0.1	0.09	7,090	5,350	-24.5
Pulp and paper	13,400	7,040	2	2	0.8	0.8	13,600	7,340	-46
Cement	3,680	4,570	0.07	0.1	0.04	0.04	3,690	4,580	24.1
Other manufacturing	20,500	18,800	0.4	0.4	0.4	0.4	20,600	18,900	-8.3
Construction	1,860	1,300	0.03	0.02	0.05	0.05	1,880	1,310	-30.3
Commercial and institutional	25,700	36,600	0.5	0.6	0.5	0.7	25,800	36,800	42.6
Residential	41,300	39,500	100	90	2	2	44,000	42,000	-4.5
Agriculture and forestry	2,400	1,930	0.04	0.03	0.05	0.06	2,420	1,950	-19.4
Transportation²	142,000	190,000	30	30	20	20	150,000	200,000	33.3
Domestic aviation	6,220	8,420	0.5	0.5	0.6	0.8	6,400	8,700	35.9
Road transportation	97,700	131,000	15	9.4	10	11	101,000	135,000	33.7
Light duty gasoline vehicles	45,100	39,800	7.8	3.2	6.2	4.1	47,200	41,200	-12.7
Light duty gasoline trucks	20,200	42,800	3.1	3.2	3.2	5.3	21,300	44,500	108.9
Heavy duty gasoline vehicles	7,950	6,370	1.3	0.38	0.22	0.43	8,050	6,510	-19.1
Motorcycles	147	255	0.14	0.16	0	0.01	151	260	72.2
Light duty diesel automobiles	355	432	0.01	0.01	0.03	0.03	363	443	22
Light duty diesel trucks	708	2,150	0.02	0.05	0.05	0.2	724	2,200	203.9
Heavy duty diesel vehicles	21,000	38,600	1	2	0.6	1	21,200	39,000	84
Propane and natural gas vehicles	2,170	706	1	0.7	0.04	0.01	2,200	720	-67.3
Railways	6,310	5,620	0.3	0.3	3	2	7,000	6,000	-14.3
Domestic marine	4,730	6,070	0.3	0.4	1	1	5,100	6,500	27.5
Others	27,000	38,000	20	20	6	9	30,000	40,000	33.3
Off road gasoline	7,000	7,000	8	8	0.1	0.2	7,000	7,000	0
Off road diesel	14,000	21,000	0.7	1	6	9	20,000	20,000	0
Pipelines	6,700	9,850	6.7	9.8	0.2	0.3	6,900	10,100	46.4
Fugitive sources	11,000	16,000	1,500	2,300	0.1	0.1	42,700	65,700	53.9
Coal mining	...	...	90	30	...	...	2,000	700	-65
Oil and natural gas	10,600	16,500	1,440	2,310	0.1	0.1	40,700	65,000	59.7
Oil	95	170	193	260	0.1	0.1	4,180	5,660	35.4
Natural gas	22.6	61	613	989	...	...	12,900	20,800	61.2
Venting	6,090	10,800	627	1,050	...	0.01	19,300	33,000	71
Flaring	4,400	5,400	2.6	3.7	0	0.01	4,400	5,500	25
Industrial processes	30,000	39,000	...	...	37.8	12.6	53,500	53,300	-0.4
Mineral products	8,300	9,500	...	...	...	...	8,300	9,500	14.5
Cement production	5,400	7,200	...	...	...	...	5,400	7,200	33.3
Lime production	1,700	1,700	...	...	...	...	1,700	1,700	0
Mineral product use ³	1,090	599	...	...	...	...	1,090	599	-45
Chemical industry	3,900	5,000	...	...	37.8	12.6	16,000	8,900	-44.4
Ammonia production	3,900	5,000	...	...	...	...	3,900	5,000	28.2
Nitric acid production	...	...	...	...	3.27	4.08	1,010	1,260	24.8
Adipic acid production	...	...	...	...	35	8.5	11,000	2,600	-76.4
Metal production	9,770	11,900	...	...	...	...	19,500	16,200	-16.9
Iron and steel production	7,060	7,010	...	...	...	...	7,060	7,010	-0.7
Aluminum production	2,700	4,800	...	...	...	...	9,300	7,900	-15.1
SF ₆ used in magnesium smelters and casters	...	...	...	...	...	...	3,110	1,300	-58.2
Consumption of halocarbons and SF₆	...	...	...	...	...	...	1,800	6,100	238.9
Other and undifferentiated production	8,300	13,000	...	...	...	...	8,300	13,000	56.6

See footnotes at the end of the table.

Table 3.46 – continued

Greenhouse gas (GHG) emissions by source and sink category

	Carbon dioxide (CO ₂)		Methane (CH ₄)		Nitrous oxide (N ₂ O)		CO ₂ -equivalents 1		
	1990	2005	1990	2005	1990	2005	1990	2005	Percentage change 1990 to 2005
kilotonnes									percent
Solvent and other product use	...	...	...	...	0.56	0.57	170	180	5.9
Agriculture	...	...	1,000	1,300	80	93	46,000	57,000	23.9
Enteric fermentation	...	...	880	1,200	...	...	18,000	25,000	38.9
Manure management	...	...	120	150	13	17	6,700	8,600	28.4
Agricultural soils	...	...	...	...	67	76	21,000	23,000	9.5
Direct sources	...	...	...	...	39	41	12,000	13,000	8.3
Pasture, range and paddock manure	...	...	...	...	10	14	3,200	4,400	37.5
Indirect sources	...	...	...	...	20	20	5,000	6,000	20
Waste	270	190	1,100	1,300	2	2	23,000	28,000	21.7
Solid waste disposal on land	...	...	1,000	1,300	...	...	22,000	27,000	22.7
Wastewater handling	...	...	11	12	2	2	780	930	19.2
Waste incineration	270	190	0.4	0.06	0.4	0.2	400	240	-40
Land use, land use-change and forestry	-130,000	-26,000	150	260	6.4	11	-120,000	-17,000	-85.8
Forest land	-160,000	-35,000	130	240	5.5	10	-150,000	-27,000	-82
Cropland	14,000	180	20	9	0.8	0.5	14,000	520	-96.3
Grassland	5,000	1,000	0.4	2	0.01	0.07	5,000	2,000	-60
Wetlands	9,000	8,000	5	5	0.2	0.2	9,000	8,000	-11.1
Settlements	...	...	...	...	...	...	...	...	...
Total 4	459,000	583,000	3,800	5,200	150	140	596,000	747,000	25.3

1. CO₂-equivalent emissions are the weighted sum of all greenhouse gas emissions. The following global warming potentials are used as the weights: CO₂=1; CH₄=21; N₂O = 310; HFCs = 140 to 11,700; PFCs = 6,500 to 9,200; SF₆= 23,900. Not all HFC, PFC and SF₆ data are presented in this table.

2. Emissions from fuel ethanol are reported within the gasoline transportation sub-categories.

3. The category Mineral product use includes CO₂ emissions coming from the use of limestone & dolomite, soda ash, and magnesite.

4. National totals exclude all GHGs from the Land use, land-use change and forestry sector.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Environment Canada, 2007, National Inventory Report: Greenhouse Gas Sources and Sinks in Canada, 1990–2005, Greenhouse Gas Division, Ottawa, Ontario, http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm (accessed March 10, 2008).

Table 3.47
Forest land by province and territory

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
thousands of hectares							
Total forest land	310,134	10,730	265	4,240	6,091	73,360	53,758
Reserved	294,836	10,658	264	3,917	6,059	72,667	50,215
Nonreserved	128,739	2,850	254	3,708	5,546	31,661	23,153
Stocked and with access	15,298	72	1	322	32	693	3,543
thousands of hectares							
	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon	Northwest Territories	Nunavut
Total forest land	18,968	20,043	27,718	57,910	7,884	28,353	815
Reserved	17,623	19,396	24,275	53,786	7,669	27,492	815
Nonreserved	6,220	6,271	13,250	31,570	1,205	3,051	1
Stocked and with access	1,345	647	3,443	4,124	214	861	..

Source(s): Natural Resources Canada, Canada's National Forest Inventory, 2001, http://nfi.cfs.nrcan.gc.ca/canfi/data/land-large_e.html, (accessed February 15, 2008).

Table 3.48
Forest area harvested by province and territory

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba
hectares								
1975	680,301	15,700 ¹	1,600 ¹	27,260	94,400 ¹	135,094 ²	196,760 ²	12,003 ¹
1976	706,120	14,700 ¹	1,600 ¹	26,285	92,800 ¹	181,737 ²	156,721 ²	17,000 ¹
1977	736,138	14,300 ¹	1,600 ¹	28,335	86,500 ¹	193,295 ²	187,993 ²	18,000 ¹
1978	826,507	17,600 ¹	1,600 ¹	32,120	89,200 ¹	226,127 ²	194,998 ²	20,000 ¹
1979	877,750	17,700 ¹	1,780 ¹	33,703	100,000 ¹	241,826 ²	218,579 ²	24,600 ¹
1980	881,004	15,175	2,500 ¹	36,439 ¹	85,900 ¹	245,000 ²	242,679 ²	15,467 ¹
1981	806,011	13,454	2,700 ¹	36,429 ¹	65,500 ¹	250,000 ²	227,603 ²	11,880 ¹
1982	762,656	8,000	2,700 ¹	35,710 ¹	72,445 ¹	195,000 ²	222,921 ²	9,854 ¹
1983	838,688	13,900	2,500 ¹	20,745 ²	81,570 ¹	272,085 ²	183,208 ²	10,002 ¹
1984	897,714	17,600	2,500 ¹	30,604 ²	83,000 ¹	280,739 ²	217,806 ²	11,154 ¹
1985	899,245	16,400	3,200 ¹	29,778 ²	87,070 ¹	266,180 ²	217,984 ²	11,259 ¹
1986	974,606	17,440	2,350	34,121 ²	86,898	297,616 ²	223,517 ²	11,128
1987	1,054,091	18,940	2,725	42,266 ²	88,976	329,300 ²	228,464 ²	12,362
1988	1,093,685	19,628	2,731	41,421 ²	99,192	337,668 ²	237,188 ²	12,378
1989	1,022,950	19,449	2,421	36,733 ²	90,114	342,231 ²	230,308 ²	12,205
1990	914,783	22,100 ¹	2,497 ¹	39,898 ¹	88,924 ¹	262,027	238,213	10,349
1991	860,824	19,044	2,311 ¹	38,169 ¹	89,808 ¹	239,009 ¹	199,720	8,518
1992	917,695	18,556	2,753 ¹	34,820 ¹	99,751 ²	262,928	190,676	11,414
1993	965,664	21,076	3,109 ¹	43,568 ¹	97,793 ¹	293,239	209,370 ¹	10,993
1994	1,011,249	19,643	3,237 ¹	49,084	92,790 ²	327,838	211,474 ¹	12,653
1995	1,037,680	19,737	3,152 ¹	49,968	109,326 ¹	346,258	214,086 ¹	14,176
1996	1,059,123	17,649	2,787 ¹	59,053	114,639 ¹	342,328	213,235 ¹	15,342
1997	1,084,407	20,000 ¹	4,338 ¹	69,761 ¹	115,875 ¹	384,370	209,286 ¹	15,544
1998	1,073,921	17,414 ¹	4,376 ¹	54,203	116,872 ¹	369,907	225,132	16,590
1999	1,059,650	22,744	5,796 ¹	49,680 ¹	110,525 ¹	370,236	207,671	15,509
2000	1,068,779	23,216 ^P	5,522 ¹	54,433	113,414 ¹	344,137 ¹	213,260 ¹	15,633
2001	1,015,316	22,980 ¹	4,903 ¹	53,226 ¹	103,460 ¹	323,609 ¹	220,607 ¹	14,849
2002	1,005,950	22,000	4,627 ¹	51,657 ¹	103,666 ¹	339,097 ¹	194,941	15,042
2003	961,027	22,110	5,754 ¹	52,904 ¹	111,315 ¹	254,850 ¹	231,217 ¹	..
2004	940,400	22,867	5,495 ¹	59,504 ¹	111,348 ¹	223,154 ^P	210,226	17,528
2005	1,108,391	23,664 ¹	2,001 ¹	54,326 ¹	111,349 ¹	356,920 ^P	225,213	13,648
2006	1,035,957	226,811	2,195 ¹	54,326 ¹	111,290 ¹	316,377 ¹	206,821 ¹	13,648 ¹
	Canada	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories		Nunavut
hectares								
1975	680,301	17,500	21,682	156,976 ²	620 ²	706		
1976	706,120	16,900	21,469	175,952 ²	560 ²	396		
1977	736,138	16,200	22,399	166,081 ²	747 ²	688		
1978	826,507	21,100	25,601	196,533 ²	935 ²	693		
1979	877,750	25,100	26,006	187,547 ²	280	629		
1980	881,004	16,930	32,280	187,834 ²	58	742		
1981	806,011	18,280	31,328	147,889 ²	45	903		
1982	762,656	15,830	37,554	162,172 ²	43	427		
1983	838,688	19,690	45,569	188,228 ²	321	870		
1984	897,714	21,910	32,312	198,453 ²	561	1,075		
1985	899,245	19,693	36,159	210,397 ²	135	990		
1986	974,606	19,356	41,604	239,877 ²	299	400		
1987	1,054,091	25,742	43,490	259,982 ²	1,172	672		
1988	1,093,685	22,089	50,125	270,401 ²	465	399		
1989	1,022,950	22,281	46,820	218,384 ²	1,554	450		
1990	914,783	16,543	51,869 ¹	181,530	366 ¹	467		
1991	860,824	17,522	52,314 ¹	193,654 ¹	350 ¹	405		
1992	917,695	18,471	55,569 ¹	221,599	639 ¹	519		
1993	965,664	19,456	58,074 ¹	207,748	634 ¹	604		
1994	1,011,249	24,221	77,507 ¹	190,244	2,056 ¹	502 ¹		
1995	1,037,680	21,907	67,979 ¹	189,608	833	650 ¹		
1996	1,059,123	21,379	71,322 ¹	199,029	1,921 ¹	439		
1997	1,084,407	17,500 ¹	71,881 ¹	173,772 ¹	1,450 ¹	630		
1998	1,073,921	21,169 ¹	71,046 ¹	176,142	489 ¹	581 ¹		
1999	1,059,650	21,169 ¹	79,161 ¹	176,312	603 ¹	244 ¹		
2000	1,068,779	21,169 ¹	73,513 ¹	204,472	7 ¹	3 ¹		
2001	1,015,316	23,222	79,354 ¹	169,055	49 ¹	2 ¹		
2002	1,005,950	25,070 ¹	82,025 ¹	167,774 ¹	42 ¹	9 ¹		
2003	961,027	29,053	79,648 ¹	174,101	44 ¹	31 ¹		
2004	940,400	29,241	79,979 ¹	180,959	48	51		
2005	1,108,391	41,825	81,684 ^P	197,599	21 ¹	141 ¹		
2006	1,035,957	291,831	81,684 ¹	197,599 ¹	12 ¹	141 ¹		

1. Estimated by provincial or territorial forestry agency.

2. Estimated by the Canadian Forest Service or by Statistics Canada.

Note(s): Data do not add up to Canada total because of unavailable data for some provinces or territories.

Source(s): Canadian Council of Forest Ministers, Compendium of Canadian Forestry Statistics, 2007, <http://nfdp.ccfm.org/compendium/index.php> (accessed February 14, 2008).

Table 3.49
Area of stocked timber-productive forest land burned

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba
hectares								
1980	1,355,074	680	..	559	2,116 ^r	4,902	330,825	304,049
1981	1,306,648	2,893	22	169	92	2,170	40,817	220,336 ^r
1982	838,789	4,392	25	359	5,407	7,202	297	7,094
1983	409,489	107	50	92	1,129	206,952	74,663	66,962
1984	181,013	1,565	8	193	270	2,397	2,219	51,099
1985	132,886	40,457	4	220	1,348 ^r	1,952	127	5,367
1986	311,367	23,511	85	268	37,216	173,296	50,598	5,495
1987	306,516	10,622	16	312	895	27,849	5,461	84,266
1988	639,777	7	2	89 ^r	1,778	273,066	35,994	295,930
1989	3,877,394	2,651	2	159	280	2,108,206	4,990	1,539,180
1990	265,990	2,601	4	477	5,198	76,825	3,200	6,728
1991	623,731	9,576	23	1,022	2,732	356,234	4,971	55,266
1992	262,846	1,014	8	805	4,668	24,295	10,331	185,299
1993	415,885	21	6	120	534	125,211	2,116	43,400
1994	742,240	692	7	67	239	2,830	410	552,571
1995	1,432,488	128	14	149	395	407,299	60,739	445,425
1996	607,686	8,519	0	172	1,591	410,342	179,207	..
1997	169,484	153	..	184	145	147,417	16,010	..
1998	313,548	4,630	..	168	275	16,721	57,659	..
1999	..	20,779	..	1,174	1,135	88,472	72,481	..
2000	..	68	..	359	269	603	613	..
2001	84,000	184	29	333	565	1,274	1,610	..
2002	..	1,238	9	149	230	405,375	18,468	..
2003	..	1,286	1	943	174	18,421	50,060	..
2004	..	289	6	130	267	717	46	..
2005	..	22	29	163	263	416,027	23,320	..
2006	..	..	17	..	..	43,438	..	..
	Canada	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories ¹	National parks	
hectares								
1980	1,355,074	89,237	465,451 ^r	32,743	111,537	12,975	..	..
1981	1,306,648	..	944,494 ^r	57,277	12,735	25,643	..	..
1982	838,789	..	462,674 ^r	280,676	68,127	2,536	..	..
1983	409,489	9,478	1,215 ^r	32,848	14,805	1,188	..	..
1984	181,013	47,281	35,259	12,227	6,995	134	21,366	..
1985	132,886	9,020	3,820	54,231	11,407	6	4,927	..
1986	311,367	4,031	1,587	9,474	3,132	11	2,663	..
1987	306,516	129,332	24,295	22,308	1,150	10	..	..
1988	639,777	24,187	5,149 ^r	3,284	288	3	..	..
1989	3,877,394	137,404	2,994 ^r	11,089	70,439	..	..	..
1990	265,990	71,198	22,143	52,575	..	..	25,041	..
1991	623,731	118,850	1,357	11,249	61,227	..	1,224	..
1992	262,846	12,768	720	17,212	3,785	..	1,941	..
1993	415,885	227,208	12,894	1,376	..	..	2,999	..
1994	742,240	79,641	8,610	20,737	..	..	76,436	..
1995	1,432,488	320,993	163,376	26,888	..	..	7,082	..
1996	607,686	4,755 ²	430	2,670	..	..	..	..
1997	169,484	1,904	3,046	286	..	..	..	339
1998	313,548	..	234,095	..	..	..	..	..
1999	..	..	52,887	..	..	..	..	..
2000	..	..	3,802	14,376 ^r	..	..	..	..
2001	84,000	..	74,538	5,467	..	..	..	..
2002	..	..	361,091	..	..	..	..	..
2003	..	..	..	..	..	..	..	..
2004	..	..	..	..	..	..	..	..
2005	..	..	..	..	..	..	..	..
2006	..	..	..	..	..	..	..	..

1. Includes Nunavut.

2. Estimated by the Canadian Forest Service or by Statistics Canada.

Source(s): Canadian Council of Forest Ministers, Compendium of Canadian Forestry Statistics, 2007, http://nfdp.ccfm.org/compendium/index_e.php (accessed February 7, 2008).

Table 3.50
Fertilized area, by province

	1981	1986	1991	1996	2001	2006
km ²						
All provinces	185,052.0	231,479.7	215,618.3	249,426.4	240,146.4	253,480.1
Newfoundland and Labrador	44.1	47.6	54.3	64.6	64.0	61.4
Prince Edward Island	1,074.4	1,133.0	1,021.2	1,195.4	1,101.0	1,121.9
Nova Scotia	885.4	850.4	822.7	885.5	883.6	819.2
New Brunswick	760.0	840.5	781.4	907.4	900.6	881.2
Quebec	11,054.0	11,892.3	9,967.2	9,910.6	10,017.2	10,436.3
Ontario	25,338.2	25,911.3	22,734.5	24,075.2	22,317.7	23,762.8
Manitoba	31,964.6	37,263.7	36,883.4	38,303.9	35,311.7	34,522.0
Saskatchewan	55,258.5	81,250.3	76,545.5	100,156.2	99,085.5	108,908.6
Alberta	55,051.7	68,548.8	63,498.8	70,314.3	67,000.2	69,652.3
British Columbia	3,621.0	3,741.9	3,309.4	3,613.2	3,464.9	3,314.4

Source(s): CANSIM table 153-0039.

Table 3.51

Manure production by major drainage area and sub-drainage area 1,2, 2001

	Drainage area code	Manure production	Phosphorous production	Nitrogen production
	code	tonnes		
Canada	...	177,502,876	296,648	1,077,469
Maritime Provinces	01	4,488,957	7,543	27,976
Saint John and Southern Bay of Fundy	01A	1,086,854	1,914	7,012
Gulf of St. Lawrence and Northern Bay of Fundy	01B	726,099	1,126	4,316
Prince Edward Island	01C	1,105,409	1,767	6,505
Bay of Fundy and Gulf of St. Lawrence	01D	1,340,580	2,341	8,658
Southeastern Atlantic Ocean	01E	138,727	246	921
Cape Breton Island	01F	91,288	149	564
St. Lawrence	02	51,416,046	89,001	320,889
Northwestern Lake Superior	02A	116,728	163	669
Northeastern Lake Superior	02B	3,358	5	20
Northern Lake Huron	02C	334,783	523	1,975
Wanapitei and French	02D	159,728	238	935
Eastern Georgian Bay	02E	1,754,632	2,860	10,684
Eastern Lake Huron	02F	7,973,999	14,278	50,277
Northern Lake Erie	02G	9,368,211	17,645	61,004
Lake Ontario and Niagara Peninsula	02H	4,472,298	7,616	28,602
Upper Ottawa	02J	720,678	1,060	4,186
Central Ottawa	02K	1,514,409	2,287	8,784
Lower Ottawa	02L	3,572,352	5,161	20,696
Upper St. Lawrence	02M	1,188,257	1,850	7,180
Saint-Maurice	02N	38,321	55	220
Central St. Lawrence	02O	11,093,102	19,933	69,999
Lower St. Lawrence	02P	7,119,799	12,327	43,679
Northern Gaspé Peninsula	02Q	933,770	1,402	5,517
Saguenay	02R	868,193	1,234	5,071
Gulf of St. Lawrence, Natashaquan	02W	3,603	7	24
Northern Newfoundland	02Y	50,496	80	316
Southern Newfoundland	02Z	129,329	277	1,051
Northern Quebec and Labrador	03	28,150	42	164
Nottaway, coast	03A	28,150	42	164
Southwestern Hudson Bay	04	408,365	634	2,419
Missinaibi and Mattagami	04L	2,773	5	19
Abitibi	04M	297,318	455	1,736
Harricanaw, coast	04N	108,274	174	664
Nelson River	05	97,126,025	159,994	579,951
Upper South Saskatchewan	05A	14,465,748	23,446	85,872
Bow	05B	5,209,815	8,432	30,883
Red Deer	05C	14,907,363	24,312	88,568
Upper North Saskatchewan	05D	2,539,851	4,023	15,029
Central North Saskatchewan	05E	8,920,280	14,499	53,280
Battle	05F	8,850,044	14,338	52,532
Lower North Saskatchewan	05G	5,185,593	8,437	30,711
Lower South Saskatchewan	05H	5,421,246	8,970	32,517
Qu'Appelle	05J	6,810,019	11,126	40,539
Saskatchewan	05K	1,114,550	1,882	6,663
Lake Winnipegosis and Lake Manitoba	05L	5,944,078	9,705	35,302
Assiniboine	05M	6,071,040	10,093	36,417
Souris	05N	4,825,143	7,754	28,476
Red	05O	5,428,119	10,488	34,469
Winnipeg	05P	401,443	686	2,446
English	05Q	27,511	41	158
Western Lake Winnipeg	05S	1,004,182	1,762	6,089
Western and Northern Hudson Bay	06	2,968,870	4,720	17,465
Beaver, Alberta and Saskatchewan	06A	2,968,870	4,720	17,465
Great Slave Lake	07	10,156,055	16,298	60,158
Upper Athabasca	07A	576,976	912	3,389
Central Athabasca, upper	07B	4,318,251	6,974	25,589
Central Athabasca, lower	07C	546,117	888	3,271
Upper Peace	07F	2,523,326	4,006	14,892
Smoky	07G	1,625,384	2,619	9,666
Central Peace, upper	07H	409,951	648	2,421
Central Peace, lower	07J	156,050	251	930
Pacific	08	8,146,042	13,979	52,146
Skeena, coast	08E	206,774	318	1,210

See footnotes at the end of the table.

Table 3.51 – continued

Manure production by major drainage area and sub-drainage area^{1,2}, 2001

	Drainage area code	Manure production	Phosphorous production	Nitrogen production
	code	tonnes		
Central coastal waters	08F	45,239	71	266
Southern coastal waters	08G	33,022	61	221
Vancouver Island	08H	468,394	762	2,993
Nechako	08J	617,518	973	3,631
Upper Fraser	08K	609,241	972	3,617
Thompson	08L	1,655,201	2,644	9,932
Lower Fraser	08M	3,341,745	6,318	23,273
Columbia	08N	1,168,908	1,860	7,003
Mississippi River	11	2,764,366	4,437	16,301
Missouri	11A	2,764,366	4,437	16,301

1. A sub-drainage area, also called a watershed or drainage basin, is an area where all contributing surface waters share the same drainage outlet. Drainage areas channel runoff from precipitation and snow melt into stream flow. The resulting hierarchy of streams and rivers and their associated sub-drainage areas form the National Hydrological Network of Canada. There are 11 major drainage areas and 164 sub-drainage areas in Canada. Canada's entire land and fresh water area has been allocated to individual drainage areas.

2. See map 2.3 and table 2.2 for classification codes and area figures for these sub-drainage areas.

Source(s): CANSIM table 153-0040.

Table 3.52

Top ten substances released to land, 2005

	Releases ¹	Share of total
	tonnes	percent
Hydrogen sulphide	268,623.7	83.8
Zinc (and its compounds)	10,077.8	3.1
Ammonia (total) ²	6,805.6	2.1
Asbestos (friable form)	6,354.4	2.0
Methanol	5,901.4	1.8
Manganese (and its compounds)	5,366.7	1.7
Phosphorous (total)	4,762.9	1.5
Lead (and its compounds)	3,126.4	1.0
Ethylene glycol	2,633.8	0.8
Vanadium (except when in an alloy) and its compounds	1,288.4	0.4

1. Data include disposals.

2. Refers to the total of both ammonia (NH_3) and ammonium ion (NH_4^+) in solution.

Source(s): Environment Canada, Pollution Data Branch, 2007, National Pollutant Release Inventory Database, http://www.ec.gc.ca/pdb/npri/npri_prev_dat_e.cfm (accessed September 24, 2007).

Table 3.53
Streamflow and surface fresh water intake in Canada by major river basin¹

	Code	Total streamflow ²	Surface fresh water intake			Water intake as share of streamflow
			Municipal ³	Industrial ⁴	Agricultural ⁵	
	code	cubic kilometres	millions of cubic metres			percent
Canada		3,315.54	4,872.83	31,491.03	4,098.19	40,462.05
Pacific Coastal and Yukon	1	595.9	192.68	597.69	78.73	869.1
Fraser - Lower Mainland	2	125.26	428.61	219.81	467.98	1,116.40
Columbia and Okanagan - Similkameen	3	65.69	71.54	109.38	228.17	409.1
Peace - Athabasca	4	91.55	28.01	169.82	21.69	219.49
Lower Mackenzie and Arctic Coast - Islands	5	507.13	6.57	5.62	0	12.22
North Saskatchewan	6	7.38	142.2	1,457.41	86.57	1,686.19
South Saskatchewan, Missouri and Assiniboine	7	9.5	435.73	753.62	2,891.82	4,081.17
- Red	8	23.9	11.48	197.23	1.14	209.85
Winnipeg	9	60.27	14.09	31.9	24.1	70.09
Lower Saskatchewan - Nelson	10	22.11	6.34	3.28	8.36	17.97
Churchill	11	169.75	0.16	0	0	0.16
Keewatin - Southern Baffin	12	189.06	12.47	86.68	0	99.54
Northern Ontario	13	530.75	5.87	59.94	0	65.83
Northern Quebec	14	226.96	3,087.12	27,229.02	271.64	30,587.41
Great Lakes - St. Lawrence	15	257.32	78.41	134.29	4.39	216.45
North Shore - Gaspé	16	24.57	97.39	109.78	2.77	209.93
Saint John - St. Croix	17	114.4	139.74	132.07	10.83	282.63
Maritime Coastal	18	294.04	114.4	193.48	0	308.51
Newfoundland - Labrador						0.1

1. These major river basins and associated flow measures are adapted from Laycock (1987) (see full reference below). Some of these river basin aggregates have more than one outflow. Basins at the US-Canada border exclude inflow from United States.
2. Streamflow is represented by the long-term annual average.
3. Municipal water intake data is derived from the Municipal Water Use Database, Environment Canada, 1998.
4. Industrial water intake data is derived from the Industrial Water Use Survey, Statistics Canada and Environment Canada, 1996.
5. Agricultural water use estimates are from Statistics Canada.

Source(s): Laycock, A.H., 1987, "The Amount of Canadian Water and its Distribution," in Canadian Aquatic Resources, no. 215 of Canadian Bulletin of Fisheries and Aquatic Sciences, M.C. Healey and R.R. Wallace (eds.), 13-42, Fisheries and Oceans Canada, Ottawa.

Table 3.54
Top ten substances released to water, 2005

		Releases	Share of total	
			tonnes	percent
Ammonia (total) ¹		53,105.2		45.5
Nitrate (ion in solution at pH >= 6.0)		52,182.0		44.7
Phosphorus (total)		6,921.8		5.9
Manganese (and its compounds)		1,438.2		1.2
Methanol		1,261.9		1.1
Ethylene glycol		572.3		0.5
Zinc (and its compounds)		263.1		0.2
Chlorine		230.5		0.2
Benzene		109.2		0.1
Copper (and its compounds)		85.7		0.1

1. Refers to the total of both ammonia (NH_3) and ammonium ion (NH_4^+) in solution.

Source(s): Environment Canada, Pollution Data Branch, 2007, National Pollutant Release Inventory Database, http://www.ec.gc.ca/pdb/npri/npri_prev_dat_e.cfm (accessed September 24, 2007).

Table 3.55
Species extinct and extirpated, 2007

Species ¹	Group	Extinction date	Probable cause(s) of extinction ² or extirpation ³
Extinct²			
Benthic Hadley Lake stickleback	fish	1999	introduced predators
Limnetic Hadley Lake stickleback	fish	1999	introduced predators
Banff longnose dace	fish	1986	introduced predators; habitat alteration
Blue walleye	fish	1965	commercial fishing; introduced predators
Lake Ontario kiyi	fish	1964	commercial fishing; introduced predators
Deepwater cisco	fish	1952	commercial fishing; introduced predators
Eelgrass limpet	mollusc	1929	loss of food source
Caribou (dawsoni subspecies)	mammal (terrestrial)	1920s	unknown
Passenger pigeon	bird	1914	hunting and predation
Sea mink	mammal (marine)	1894	trapping
Labrador duck	bird	1875	hunting; habitat alteration
Macoun's shining moss	moss	1864	habitat alteration
Great auk	bird	1844	hunting
Extirpated³			
Karner blue	arthropods	1991	loss of food source; habitat alteration
Frosted elfin	arthropods	1988	successional change
Greater prairie-chicken	bird	1987	habitat alteration
Black-footed ferret	mammal (terrestrial)	1974	loss of food source
Striped bass (St. Lawrence Estuary population)	fish	1968	illegal fishing
Dwarf wedgemussel	mollusc	1968	habitat alteration
Greater sage grouse (phaios subspecies)	bird	1960s	hunting; habitat alteration
Pacific pond turtle	reptile	1959	commercial harvesting; habitat alteration
Gravel chub	fish	1958	habitat alteration
Pacific gophersnake	reptile	1957	habitat alteration
Spring blue-eyed Mary	plant	1954	habitat alteration
Timber rattlesnake	reptile	1941	hunting; habitat alteration
Paddlefish	fish	1917	habitat alteration; over-fishing
Tiger salamander (Great Lakes population)	amphibian	1915	habitat alteration
Island marble	arthropods	before 1910	loss of food source; habitat alteration
Puget Oregonian snail	mollusc	1905	unknown
Pygmy short-horned lizard (British Columbia population)	reptile	1898	habitat alteration
Atlantic Salmon	fish	last reported in 1898	habitat destruction and over-exploitation by a food and commercial fishery
Illinois tick-trefoil	plant	1888	habitat alteration
Grizzly bear (Prairie population)	mammal (terrestrial)	1880s	hunting
Incurved grizzled moss	moss	1828	unknown
Grey whale (Atlantic population)	mammal (marine)	1800s	hunting

1. Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.

2. A species that no longer exists.

3. A species no longer existing in the wild in Canada, but occurring elsewhere.

Source(s): Committee on the Status of Endangered Wildlife in Canada, 2007, Canadian Species at Risk, http://www.cosewic.gc.ca/eng/sct0/rpt/dsp_booklet_e.htm (accessed January 22, 2008).

Table 3.56
Species¹ extinct and at risk, 2007

	Assessment of the Committee on the Status of Endangered Wildlife in Canada					Total
	Extinct ²	Extirpated ³	Endangered ⁴	Threatened ⁵	Special concern ⁶	
number						
Mammals	2	3	21	17	26	69
Birds	3	2	27	16	23	71
Fish	6	4	34	26	41	111
Amphibians	0	1	7	5	7	20
Reptiles	0	4	12	14	8	38
Molluscs	1	2	16	3	4	26
Arthropods ⁷	0	3	15	6	4	28
Vascular plants	0	2	84	50	32	168
Lichens	0	0	2	1	6	9
Mosses	1	1	7	3	4	16
Total	13	22	225	141	155	556

1. Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
2. A species that no longer exists.
3. A species no longer existing in the wild in Canada, but occurring elsewhere.
4. A species facing imminent extirpation or extinction.
5. A species likely to become endangered if limiting factors are not reversed.
6. A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
7. Formerly described as lepidopterans.

Source(s): Committee on the Status of Endangered Wildlife in Canada, 2007, Canadian Species at Risk, http://www.cosewic.gc.ca/eng/sct0/rpt/dsp_booklet_e.htm (accessed January 22, 2008).

Table 3.57
Invasive species of high threat¹ in Canada

	Native range	Invasive range	Time of invasion	Invasion pathway	Impacts
Amphibians					
Bullfrog (<i>Rana catesbeiana</i>)	Eastern North America; Southern Ontario to Florida	Southern Vancouver Island, Southwestern British Columbia	1930s and 40s	Introduced for farming	Competition for habitat and food; predation on native species
Algae					
Dead man's fingers/Oyster thief (<i>Codium fragile</i>)	Japan	Atlantic Canada, especially Nova Scotia	1996	Attachment to hulls of ships, imported oysters; natural dispersal	Competition with native species; direct harm to mussels and oysters; habitat destruction
Disease pathogens					
Fish parasite (<i>Glugia</i>)	Atlantic Ocean	Great Lakes	Discovered 1960, probably introduced in 1912	Imported with infected rainbow smelt	Caused severe mortality in commercial rainbow smelt
Fish					
Chain pickerel (<i>Esox niger</i>)	Florida, Texas, Ontario	Ontario, Quebec, Nova Scotia (lakes)	First spotted in the 1940s	Illegal dumping by anglers for sport fishing	Competition with native species
Sea lamprey (<i>Petromyzon marinus</i>)	Atlantic Coast, Lake Ontario and St. Lawrence Seaway	Upper Great Lakes	Established in all the Great Lakes by 1938	Construction of the Welland Canal allowed access past natural barrier of Niagara Falls	Parasitizes native fishes; contributed to extinction of several native fishes
Silver carp (<i>Hypophthalmichthys molitrix</i>)	China	Great Lakes (potentially)	1980s and 90s, current	Aquaculture escape	Competition for habitat and food
Fungi					
Chestnut blight (<i>Cryphonectria parasitica</i>)	Asia	Eastern North America	Late 1800's	Introduced on Asian chestnut trees	Destroys native chestnut trees
Dutch elm disease (<i>Ophiostoma ulmi</i>)	Europe	Southern Canada	1944	Imported elm logs; transmitted domestically by elm bark beetles	Kills infected trees
Insects					
Beech scale (<i>Cryptococcus fagisuga</i>)	Germany, France	Nova Scotia, Quebec, Ontario	1890s	Introduced on infested ornamental beech trees	Damages native beech trees
Pine shoot beetle (<i>Tomicus piniperda</i>)	Europe, North Africa, Asia	Ontario, Quebec, Northeastern U.S.A.	First found in 1992	Imported accidentally in wood shipping crates	Kills infected trees
Winter moth (<i>Operophtera brumata</i>)	Europe and Asia	Nova Scotia, New Brunswick, British Columbia	1950 in Nova Scotia, 1977 in British Columbia	Imported with plant nursery stock	Defoliation; hybridizes with native bruce spanworm
Molluscs					
Zebra mussel (<i>Dreissena polymorpha</i>)	Caspian Sea, Black Sea	Great Lakes	Discovered in 1988	Ballast water release; spread by boaters	Economic impacts; phytoplankton reduction; competition with native species; attach to all hard surfaces
Plants					
Canada/creeping thistle (<i>Cirsium arvense</i>)	Europe and Eastern Mediterranean	British Columbia, Saskatchewan, Alberta, Manitoba, Ontario, Quebec, Newfoundland and Labrador, Nova Scotia, New Brunswick and Southwestern U.S.A.	1600s	Introduced by settlers in contaminated seed stock	Replaces native species; damages farmland
Common buckthorn (<i>Rhamnus cathartica</i>)	Eurasia, North Africa	British Columbia, Alberta, Saskatchewan, Quebec, Nova Scotia, Prince Edward Island, Ontario	First recorded in the late 1890s	Introduced for landscaping; seeds spread by birds	Habitat destruction; excludes native seedlings
Dog-strangling vine (<i>Cynanchum louiseae</i>)	Europe	British Columbia, Ontario, Quebec	1930s	Introduced for use as filling for life jackets	Displaces native plants

See footnotes at the end of the table.

Table 3.57 – con't

Invasive species of high threat¹ in Canada

	Native range	Invasive range	Time of invasion	Invasion pathway	Impacts
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	Europe, Asia, North Africa	Ontario, Quebec, British Columbia	1960s	Aquarium and ballast water release; spread by boaters	Replaces virtually all species in wetlands and streams in which it colonizes
Flowering rush (<i>Butomus umbellatus</i>)	Europe, temperate Asia	Quebec, Eastern and Southwestern Ontario, Alberta, British Columbia, Manitoba, Nova Scotia	1897 in Quebec	Garden escape; spread by boaters	Suspected habitat destruction, displacement of native plants
Garlic mustard (<i>Alliaria petiolata</i>)	Europe	Ontario, Quebec, New Brunswick, British Columbia	1879 in Toronto, Ontario	Introduced for cultivation	Replaces native herbaceous vegetation
Glossy buckthorn (<i>Frangula alnus</i>)	Eurasia, North Africa	South and Eastern Ontario, Great Lakes, Quebec, Nova Scotia, Manitoba	First collected in Southern Ontario in 1898	Garden escape	Forms dense stands, shading out native species
Japanese knotweed (<i>Polygonum cuspidatum</i>)	Japan	British Columbia, Manitoba, Ontario, Quebec, Newfoundland and Labrador	Late 1800s	Garden escape	Competition with native flora; infests development areas and urban sites
Leafy spurge (<i>Euphorbia esula</i>)	Europe and Asia	British Columbia, Saskatchewan, Alberta, Manitoba, Ontario, Quebec, Nova Scotia, Prince Edward Island	First reported in Canada in Ontario, 1889	Ballast water release; contaminated seed stock; spread by birds	Competition with native forbs and grasses; destruction of grazing lands; poisonous to livestock
Oriental bittersweet (<i>Celastrus orbiculatus</i>)	Eastern Asia	Southeastern Canada	1860s	Introduced for gardening; seeds spread by birds	Displaces native flora; outcompetes and hybridizes with native climbing bittersweet
Purple loosestrife (<i>Lythrum salicaria</i>)	Europe and Asia	Coast to coast in Southern Canada	Early 1800s	Possible intentional; release; sale as a garden ornamental plant; ballast water release	Habitat destruction; competition with native plants
Yellow bush lupine (<i>Lupinus arboreus</i>)	Pacific Coast	Pacific Coast, British Columbia	Current	Rapidly expanding native range; widely planted for ornamental purposes	Changes soil conditions, reducing viability of native lupine; hybridizes with other lupine

1. High threat status as indicated in the Canadian Wildlife Federation's Invasive Species in Canada.

Source(s): Canadian Wildlife Federation, 2003, Invasive Species in Canada.

Table 3.58
Harvest estimates for selected waterfowl species

	Canada geese	American black ducks	Mallards
number			
1975	358,177	307,360	1,730,981
1976	317,257	350,532	1,935,903
1977	333,273	356,496	1,557,130
1978	395,569	380,607	1,522,632
1979	416,667	319,804	1,609,618
1980	450,744	363,873	1,533,585
1981	360,969	321,987	1,296,941
1982	396,196	336,945	1,213,941
1983	469,552	309,139	1,327,609
1984	420,091	306,589	1,059,251
1985	452,498	299,762	911,076
1986	453,834	296,081	879,125
1987	507,283	295,392	1,020,609
1988	395,673	300,228	668,554
1989	510,370	261,324	744,007
1990	501,660	243,009	734,613
1991	472,182	225,938	629,139
1992	380,469	206,511	579,810
1993	434,157	203,313	536,999
1994	414,220	175,459	625,412
1995	396,004	187,161	603,342
1996	500,105	163,601	641,090
1997	489,478	165,469	718,695
1998	531,353	158,379	663,919
1999	565,242	174,943	633,196
2000	612,056	154,918	676,376
2001	637,016	124,075	591,760
2002	645,664	122,642	546,594
2003	671,654	109,223	511,486
2004	626,801	91,764	523,728
2005	712,042	89,580	544,006
2006	678,011	104,030	613,262

Source(s): Environment Canada, Canadian Wildlife Service, 2007, National Harvest Survey Database, http://www.cws-scf.ec.gc.ca/harvest/hews_e.cfm (accessed February 18, 2008).

Table 3.59
Pelts harvested by province and territory, 2005

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
number							
Wild¹							
Badger	789						0
Bear	2,286	1		63	19	981	60
Beaver	198,421	2,786	415	5,147	9,735	53,217	69,204
Coyote (prairie wolf)	67,633	282	236	1,698	2,229	4,961	2,421
Ermine (weasel)	32,716	2,742	19	678	1,432	13,738	4,953
Fisher	19,772			156	557	6,339	8,474
Fox	31,649	3,224	639	535	1,294	12,589	2,950
Lynx	8,447	258	0	0		2,576	1,012
Marten	131,621	5,803			2,846	43,359	27,639
Mink	26,929	3,669	397	1,473	1,241	6,495	8,209
Muskrat	262,839	814	2,815	18,847	23,730	65,126	69,163
Otter	16,957	1,255		338	494	3,931	7,437
Raccoon	42,777		724	3,434	2,542	11,378	21,321
Skunk	636		2	18	20	376	165
Squirrel	85,677	1,872	191	4,043	570	5,052	3,430
Wildcat or bobcat	1,517		0	769	455	0	69
Wolf	2,605	24	0	0		465	474
Wolverine	485					0	6
Other ²	9,732	0	0	0	0	0	176
Total wild	943,488	22,730	5,438	37,199	47,164	230,583	227,163
Ranch-raised³							
Fox	11,100	2,080	2,000	1,100	1,330	2,190	680
Mink	1,417,000	49,600	26,700	762,100	19,400	43,900	264,500
Total ranch-raised	1,428,100	51,680	28,700	763,200	20,730	46,090	265,180
	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories	Nunavut
number							
Wild¹							
Badger	148	318	323	0		25	1
Bear	897	78	122	39	0		
Beaver	20,457	13,619	17,829	3,878	245	1,822	67
Coyote (prairie wolf)	8,566	17,033	28,807	1,369	29	2	0
Ermine (weasel)	2,899	1,356	2,581	1,670	29	619	0
Fisher	1,525	760	1,461	466	1	33	0
Fox	2,298	2,237	2,246	237	68	1216	2,116
Lynx	741	329	817	1,146	497	1071	0
Marten	16,420	2,631	5,519	14,267	3,444	9,693	0
Mink	2,427	953	899	552	34	580	0
Muskrat	32,918	23,268	16,652	1123	659	7,724	0
Otter	1,842	732	375	529	11	13	0
Raccoon	2,153	975	96	154			
Skunk	0	15	34	6			
Squirrel	3,593	3,079	52,936	9,675	549	687	0
Wildcat or bobcat	5	2	63	154			
Wolf	256	152	367	183	164	127	393
Wolverine	32	14	24	123	106	126	54
Other ²					0	229	9,327
Total wild	97,177	67,551	131,151	35,571	5,836	23,967	11,958
Ranch-raised³							
Fox	170	190	x	x			
Mink	40,800	0	x	x			
Total ranch-raised	40,970	190	37,100	174,260			

1. Data on wildlife furs are on a "fur year basis" which is from July 1 to June 30.

2. Includes hair seals and other fur-bearing animals.

3. The ranched fur estimates operate on a calendar year basis, with most ranch pelting occurring in the fall.

Source(s): Statistics Canada, Agriculture Division; Fur Statistics 2006, catalogue no. 23-013-X.

Table 3.60
Value of pelts harvested by province and territory, 2005

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario
dollars							
Wild 1							
Badger	22,470						0
Bear	203,798	71		5,664	1,829	77,587	6,836
Beaver	6,280,112	92,439	15,411	177,934	367,050	1,865,788	1,997,919
Coyote (prairie wolf)	2,784,383	4,391	7,738	44,974	66,477	150,169	47,234
Ermine (weasel)	245,118	19,194	68	3,774	14,409	111,965	29,668
Fisher	1,780,742			13,042	54,224	543,506	804,776
Fox	954,391	129,156	27,529	16,843	43,926	404,860	82,501
Lynx	1,301,726	36,610	0	0		391,732	141,083
Marten	11,515,751	558,713			208,631	3,932,661	2,203,381
Mink	610,145	59,548	10,273	35,088	32,640	144,903	197,673
Muskrat	1,899,934	5,226	23,648	151,718	171,678	462,395	511,806
Otter	2,103,160	171,998		40,131	66,432	467,671	804,163
Raccoon	552,883		9,654	43,875	34,234	153,148	268,645
Skunk	5,097		8	182	164	3,004	1,193
Squirrel	124,501	3,089	310	5,977	916	6,416	5,042
Wildcat or bobcat	214,251		0	112,040	61,761	0	4,926
Wolf	279,623	4,979	0	0		28,226	27,132
Wolverine	84,528					0	325
Other 2	474,509	0	0	0	0	0	306
Total wild	31,437,122	1,085,414	94,639	651,242	1,124,371	8,744,031	7,134,609
Ranch-raised 3							
Fox	1,061,493	198,910	191,260	105,193	127,188	209,430	65,028
Mink	95,539,741	3,328,072	1,735,762	54,174,810	1,302,285	2,911,785	16,732,217
Total ranch-raised	96,601,234	3,526,982	1,927,022	54,280,003	1,429,473	3,121,215	16,797,245
	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories	Nunavut
dollars							
Wild 1							
Badger	2,802	12,765	6,903	0			
Bear	77,366	6,157	12,259	2,790	0	11,619	1,620
Beaver	590,594	407,072	532,196	109,631	7,105	50,420	66,553
Coyote (prairie wolf)	336,815	740,765	1,337,509	47,162	1,131	18	0
Ermine (weasel)	19,771	13,262	11,821	15,531	212	5,443	0
Fisher	104,524	73,682	140,183	43,385	88	3,332	0
Fox	59,759	53,975	58,621	5,055	1,836	31,773	38,557
Lynx	112,580	59,493	120,516	206,246	75,047	158,419	0
Marten	1,371,891	281,885	503,609	1,145,783	292,740	1,016,457	0
Mink	57,180	27,580	16,578	11,029	986	16,667	0
Muskrat	186,974	175,441	157,028	4324	4811	44,885	0
Otter	295,162	135,376	38,651	80,821	1243	1,512	0
Raccoon	26,762	13,806	1259	1,500			
Skunk	0	102	398	46			
Squirrel	4,958	4,341	76,757	13,835	1043	1817	0
Wildcat or bobcat	744	500	10,040	24,240			
Wolf	34,048	25,278	30,997	15,066	21,156	21,808	70,933
Wolverine	6,421	3,035	4,068	20,792	21,412	19,451	9,024
Other 2					0	16,984	457,219
Total wild	3,288,351	2,034,515	3,059,393	1,747,236	428,810	1,400,605	643,906
Ranch-raised 3							
Fox	16,257	18,170	x	x			
Mink	2,678,141	0	x	x			
Total ranch-raised	2,694,398	18,170	2,645,813	10,160,913			

1. Data on wildlife furs are on a "fur year basis" which is from July 1 to June 30.

2. Includes hair seals and other fur-bearing animals.

3. The ranched fur estimates operate on a calendar year basis, with most ranch pelting occurring in the fall.

Source(s): Statistics Canada, Agriculture Division; Fur Statistics 2006, Catalogue no. 23-013-X.

Section 4

Annual statistics: Socio-economic response to environmental conditions

4.1 Legislation

The aim of the *Canadian Environmental Protection Act* (CEPA) is to prevent pollution and protect the environment and human health. It also provides enforcement officers with the authority to address cases of alleged non-compliance with the Act. Enforcement activities include inspection to verify compliance, investigation of alleged violations, measures to compel compliance without resorting to formal court action, and measures to compel compliance through court action.

Enforcement activities declined between 1991/1992 and 1996/1997 but have since risen significantly due to an increase in the number of inspections conducted and warnings issued (Table 4.1). The number of prosecutions varies considerably from year to year with as few as 2 in 1998/1999 to 27 in 2001/2002.

4.2 Protected areas

Data from 2005 indicate that 9.4% of the total land area in Canada is protected (Table 4.2). The share of total land protected varies with jurisdiction; in 2005, it ranged from 2.8% in Prince Edward Island to 13.1% in British Columbia.

4.3 Environmental protection expenditures

Total environmental protection expenditures by Canadian businesses were \$6.8 billion in both 2002 and 2004, up from \$5.4 billion in 2000 (Tables 4.3 and 4.4). Individually, operating and capital expenditures on environmental protection remained steady from 2002 to 2004. The industry with the

highest total environmental protection expenditures in 2004 was the Petroleum and coal products industry.

Approximately half of the total capital expenditures on pollution prevention in 2004 were directed towards processes aimed at preventing the release of substances to air (Table 4.5). Capital expenditures on pollution abatement and control (PAC) projects were also directed largely at mitigating the release of air pollutants, accounting for 58% of PAC capital spending in 2004 (Table 4.6).

4.4 Environmental practices

Pollution prevention attempts to eliminate waste and pollution before it is created in manufacturing processes. It involves continuous improvement through changes in product design, technology, operations and behaviour. Table 4.7 examines pollution prevention methods adopted by industry. In 2004, the most widely used methods of pollution prevention were good operating practices or pollution prevention training (69%), prevention of leaks and spills (67%) and recirculation, recovery, reuse or recycling (62%).

Environmental management practices are used by businesses to facilitate reducing or preventing of pollution or the conserving of resources. In 2004, 73% of reporting establishments indicated using at least one environmental management practice (Table 4.8). The most widely reported practice was the use of an environmental management system (58%), followed by the implementation of a pollution prevention plan (42%).

In 2004, 1,037 kg of non-hazardous solid waste were generated per capita; an increase of 6% from 2002 (Table 4.9). Nationally, 24% of the total non-hazardous waste generated was diverted from disposal. Nova Scotia had the highest diversion rate (36%) followed closely by Prince Edward Island (35%) and British Columbia (31%). In 2004 the lowest disposal rate was in Nova Scotia (427 kg per capita), and the highest disposal rate was in Alberta (968 kg per

capita). In 2004, 39% of waste came from residential sources (Table 4.10).

More than 7.8 million tonnes of non-hazardous material were processed for recycling in 2004 (Table 4.11). Newsprint (17%), cardboard and boxboard (17%), and organic material (21%) made up the bulk of the recycled material in 2004.

4.5 Environment industry

Revenues derived from environment-related activities reached \$18.5 billion in 2004 (Table 4.12). Environmental services accounted for 45% of total environmental revenues, while 55% of these revenues were derived from environmental goods. The wholesale trade industry posted the highest share of business sector total environmental revenues at 29%, followed by the waste management and remediation services industry at 23% and the construction industry at 12%.

As in previous years, businesses in Ontario and Quebec reported the highest environmental revenues (Table 4.13).

4.6 Research and development

In 2005/2006, expenditures on research and development in the higher education sector reached approximately \$9.5 billion (Table 4.14). Forty percent (\$3.8 billion) was spent in the natural sciences and engineering fields, 40% (\$3.8 billion) in the health sciences and the remaining 20% (\$1.9 billion) in the social sciences and humanities.

In 2005/2006, federal spending on research and development aimed at control and care of the environment reached \$401 million (Table 4.15). This accounted for 7% of total federal research and development expenditures in 2005/2006, and marks an increase of \$231 million over the amount spent in 1997/1998 on this objective. Additional expenditures on environmental research and development may be included in other socio-economic objective categories. For example, research on energy conservation may be included under "Production, distribution and rational utilization of energy".

Table 4.1

Canadian Environmental Protection Act enforcement activities¹

	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998
number							
On-site inspections ²	1,616	1,278	1,571	1,335	963	708	1,523
Off-site inspections ^{2, 3}	..	..	..	..	..	..	..
Investigations ⁴	115	96	55	64	45	33	56
Warnings ⁵	82	105	133	127	85	30	204
Directions ⁶	6	4	1	1	0	2	0
Prosecutions ⁷	17	26	3	9	13	5	8
Convictions	10	18	11	12	6	7	3
Total	1,846	1,527	1,774	1,548	1,112	785	1,794
number							
	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005
On-site inspections ²	1,555	779	1,446	1,628	1,934	2,334	2,547
Off-site inspections ^{2, 3}	1,058	2,526	1,801	3,009	2,870	2,079	2,727
Investigations ⁴	78	64	20	57	36	32	43
Warnings ⁵	421	473	450	517	347	672	1,162
Directions ⁶	8	9	22	5	3	8	2
Prosecutions ⁷	2	26	11	27	4	8	13
Convictions	1	1	7	7	3	14	1
Total	3,123	3,878	3,757	5,250	5,197	5,147	6,495

1. Data is based on the federal government "fiscal year" which is from April 1 to March 31.

2. Inspections verify compliance with the *Canadian Environmental Protection Act* (CEPA). They may be on-site (at the site of a facility, plant, structure, border crossing, airport or other port of entry, on a ship, aircraft, or other means of transport) or off-site. Off-site inspections were previously called administrative verifications.

3. The tracking of off-site inspections or administrative verifications only started in 1998/1999. However, on-site inspection numbers prior to this time may have included some administrative verifications.

4. Investigations involve gathering, from a variety of sources, evidence and information relevant to a suspected violation.

5. Written warnings indicate the existence of a minor violation, in order that the alleged offender can take notice and return to compliance.

6. Written directions oblige the regulatee responsible for the potential violation to take all reasonable measures to remedy any dangerous conditions and/or to reduce any danger to the environment.

7. A legal proceeding for the purpose of determining the guilt or innocence of an accused (that is, person and/or organization) under CEPA.

Source(s): Environment Canada, Information Management Services, Enforcement Branch, National Programs Directorate and Environment Canada, *Canadian Environmental Protection Act* annual reports, <http://www.ec.gc.ca/ele-ale/default.asp?lang=En&n=5C63F879-1> (accessed March 6, 2006).

Table 4.2

Total terrestrial protected areas by province and territory, 2005

	Protected areas ¹	Area protected ²	Amount of land ³	Percentage of land protected ⁴
	number	km ²		percent
Canada	8,475	855,973	9,093,507	9.4
Newfoundland and Labrador	63	18,383	373,872	4.9
Prince Edward Island	184	161	5,660	2.8
Nova Scotia	75	4,557	53,338	8.5
New Brunswick	106	2,321	71,450	3.2
Quebec ⁵	1,096	75,652	1,365,128	5.5
Ontario ⁶	666	94,614	917,741	10.3
Manitoba ⁷	122	42,755	553,556	7.7
Saskatchewan	4,608	53,375	591,670	9.0
Alberta	537	82,501	642,317	12.8
British Columbia	948	120,882	925,186	13.1
Yukon Territory	24	52,348	474,391	11.0
Northwest Territories	19	94,894	1,183,085	8.0
Nunavut Territory	27	213,530	1,936,113	11.0

1. Includes protected areas administered federally, provincially and territorially, as well as Aboriginal or privately held conservation lands that are recognized by protected area agencies as being part of their network.

2. These figures include a number of terrestrial protected areas that have a marine component totalling 28,995 km².

3. Includes only land area. For example, when freshwater is included, the total area of the country is 9,984,670 km².

4. Percent of land protected differs from the Canadian Protected Areas Status because only land area (not land and water) was used as referenced below.

5. Includes the terrestrial portion of Environment Canada's 28 Migratory Bird Sanctuaries that are found in Quebec, and the marine portion of these Sanctuaries (431 km²).

6. Included are 19 sites or 322 km² of National Wildlife Areas (NWAs) and Migratory Bird Sanctuaries (MBSs) that are located in Ontario and administered by Environment Canada.

7. Manitoba does not currently recognize Environment Canada administered National Wildlife Areas as part of their protected areas network. Excluded are 1,682 km² of Agriculture Canada administered PFRA pastures. These lands will be reviewed in the near future.

Source(s): Government of Canada. 2007. Canadian Protected Areas Status Report 2000-2005, http://www.cws-scf.ec.gc.ca/publications/habitat/cpa-apc/index_e.cfm, (accessed July 18, 2007). Statistics Canada, Land and freshwater area, by province and territory, <http://www40.statcan.ca/01/cst01/phys01.htm?sd1=land%20area> (accessed November 16, 2007). Statistics Canada, Environmental Accounts and Statistics Division.

Table 4.3

Operating expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe), waste management and sewerage service	Pollution prevention processes	Fees, fines and licences	Other	Total
millions of dollars									
1995									
Logging	3.2	10.8	21.2	44.4	8.7	0.2	8.8	2.6	99.8
Crude petroleum and natural gas	7.9	4.1	47.7	1.1	97.6	9.5	2.3	19.7	189.8
Mining	23.5	8.8	68.3	7.4	105.5	9.5	3.8	12.2	239
Electric power systems	8.7	19.3	25.7	x	45	x	x	79.8	283.6
Food	7.6	3.2	2	0.5	61.3	2.3	3.4	2	82.3
Beverage	1.1	0.5	0.9	0	12.7	0.2	0.8	2	18.3
Pulp and paper	68.9	7.5	8	6.1	145	31.3	12.3	23.3	302.5
Refined petroleum and coal products	4.4	0.6	34.7	x	58	x	x	3.8	102.1
Chemicals	26.6	7.7	23.4	0.7	80.3	5.7	1.4	9.8	155.4
Non-metallic mineral products	4.1	1.3	9	0.3	13.6	3.9	1.5	2.3	36
Primary metals	35.5	4.1	27.6	4	208.9	84.1	4.5	10.8	379.4
Pipeline transport and gas distribution systems	5.5	1.9	3.4	0.3	8.8	1.1	1.6	8.5	31.1
Operating expenditures, excluding "other manufacturing"	197.1	69.6	271.7	88.5	845.4	210.1	60.1	176.9	1,919.5
Other manufacturing ^{1,2}	..	..	..	..	..	..	..	..	466.6
1996									
Logging	3.5	8.5	24.8	84.3	13.4	0.1	6	1.8	142.5
Crude petroleum and natural gas	18.2	5.1	85.2	7.6	98.2	3.6	3.8	34.3	256
Mining	29.5	7.4	68.6	5.6	117.2	14.9	5.3	22.8	271.3
Electric power systems	8.8	22.5	13.4	x	95.7	x	42	23.5	297.6
Food and tobacco products	9.3	2.7	4.9	1.5	69.9	3.1	4.8	4.6	100.7
Beverage	1.1	0.4	0.4	0	14	0.1	2.4	2.3	20.6
Pulp and paper	92.1	12.6	7.6	18	236.8	31.8	9.6	21.3	429.8
Refined petroleum and coal products	22.7	2.6	5.1	x	114.8	42.1	x	22.2	212.5
Chemicals	37.5	9.1	38.3	x	102.3	x	x	15.4	216.5
Non-metallic mineral products	4.2	1.5	5.3	0.1	14.3	0.3	2.5	3.3	31.5
Primary metals	33.2	5.3	40.7	6.9	293.3	80	6.8	19.6	485.8
Transportation equipment	5.2	2.1	4.7	0.1	99.5	3.7	0.8	9.7	125.8
Pipeline transport and gas distribution systems	1.4	2.6	5.7	x	11.4	0	x	12.6	35.7
Operating expenditures, excluding "other manufacturing"	266.8	82.3	304.6	142.7	1,280.9	265.8	89.7	193.3	2,626.0
Other manufacturing ²	..	..	..	..	..	..	..	..	357.7
1997									
Logging	1.6	3.1	10.5	68.8	7.9	1.7	0.5	2	96.1
Crude petroleum and natural gas	17.4	13.4	107.4	1.6	61.1	15.2	6.8	26	248.8
Mining	20.4	7.5	54.9	3.2	122.4	39	4.1	20	271.6
Electric power systems	6.4	x	x	25.6	70.2	x	30.2	28.7	240.3
Food and tobacco products	8.3	x	x	0.6	70.6	x	9.7	3.4	115.8
Beverage	0.6	0.5	1.4	0	13.4	1.3	2.8	2.2	22.2
Wood products ³	5.9	2.2	5.9	10.4	28.9	8.9	6.6	2.8	71.7
Pulp and paper	52.6	11.9	6.4	25.4	251.1	95.7	9.2	26.1	478.3
Refined petroleum and coal products	7.3	3.8	32.8	0.5	111.2	66	0.2	13.5	235.3
Chemicals	31.9	7	30.6	1.3	104.7	34.1	2.2	15.1	226.9
Non-metallic mineral products	1.8	3.2	6.2	0	17.6	5.5	1.4	3.4	39.1
Primary metals	44	5.6	28.5	6	319	60.5	4.9	16.9	485.4
Transportation equipment	6.5	2.7	2.8	3.8	101.7	12	1.4	8.7	139.5
Pipeline transport and gas distribution systems	1.4	2.6	5	0.3	13.4	2.9	0.9	8.3	34.8
Operating expenditures, excluding "other manufacturing"	206.1	81.0	298.2	147.4	1,293.2	421.8	80.9	177.2	2,705.9
Other manufacturing ²	..	..	..	..	..	..	..	..	291.2

See footnotes at the end of the table.

Table 4.3 – continued

Operating expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe), waste management and sewerage service	Pollution prevention processes	Fees, fines and licences	Other	Total
millions of dollars									
1998⁴									
Logging	3	5	19.1	70.4	5.4	4.4	1.4	7.8	116.5
Oil and gas extraction	16	8.6	110.2	1.3	55	26.4	9.2	31.7	258.4
Mining	20.6	4.8	55.8	2.3	104.9	38.7	4.6	17.2	248.8
Electric power generation, transmission and distribution	6.6	34.2	5.7	12	x	5.3	32.7	x	295.6
Natural gas distribution	0.3	1.6	0.6	0.1	2.4	0.7	0.1	3.2	8.9
Food	11	2.6	0.2	3.7	78.4	14.2	9.6	4	123.7
Beverage and tobacco products ⁵	0.8	0.5	0.9	..	13.3	1.6	2.3	1.8	21.2
Wood products	8.5	2.4	15.8	29.4	x	21.4	5.6	x	137.6
Pulp, paper and paperboard mills	43.7	3.6	3.3	11.4	241.9	62.8	8	12.8	387.5
Petroleum and coal products ⁵	7.3	2.4	4.2	..	101.5	56.4	1.1	14.4	187.3
Chemicals	25	6.5	42.3	1.3	101.5	34.5	2.5	18.3	231.9
Non-metallic mineral products	2.5	3.3	2.8	1	20.8	5.9	2.8	4.1	43.2
Primary metals	37.2	5.8	16.9	5.8	275.7	61.4	2.7	13.6	419.2
Transportation equipment	5.8	2.3	18	0.1	89.8	10.8	0.9	11.7	139.4
Pipeline transportation ⁶	2	0.7	4.2	0.3	8.1	4.4	1.4	11.2	32.2
Operating expenditures, excluding "other manufacturing"	190.2	84.3	300.1	139.2	1,304.8	348.8	84.9	199.1	2,651.4
Other manufacturing ²	..	..	..	..	..	..	..	..	338.8
2000⁷									
Logging	3.8	9.4	29.6	106.4	3.8	3.8	1.2	3.4	161.4
Oil and gas extraction	19.7	15	117.4	3	81.2	35.7	12.9	39.7	324.7
Mining	25.5	14.4	53.2	4.1	99.9	44.1	8.7	17.7	267.6
Electric power generation, transmission and distribution	9.1	16.4	23	6.8	106.3	28.9	10.5	54.9	255.8
Natural gas distribution ⁸	0.2	0.3	0.5	..	1.7	0.4	0.1	3	6.1
Food	15.5	3.6	7.6	0.5	84.8	11.1	13.4	4.2	140.7
Beverage and tobacco products ⁸	1.1	1.1	0	..	14	1.1	4.7	1.3	23.4
Wood products	8.5	5	18.8	17.5	69.1	11.2	7.7	5.9	143.7
Pulp, paper and paperboard mills	51.1	5.1	12.2	6.8	263.3	67.7	6	13.3	425.4
Petroleum and coal products	7.3	7	11.2	0.9	85.6	75.5	9.6	15.9	212.9
Chemicals	29.9	6.3	22.5	1.1	106.9	42.4	1.8	21.3	232
Non-metallic mineral products	2.9	1.9	5	0.7	21.4	6.1	2.8	4.3	43.6
Primary metals	40.4	8.6	28.4	2	327.2	64.4	4.3	15.3	490.6
Fabricated metal products ⁹	3.1	1.5	1.5	0.1	52.8	5.2	0.4	5	69.6
Transportation equipment	6.5	4.6	2.5	0.1	119.3	15.8	1.5	19.9	170.2
Pipeline transportation ⁶	5.2	6.8	18.2	3.9	6.4	10.1	3.8	6.5	61
Operating expenditures, excluding "other manufacturing"	229.8	106.8	351.7	153.8	1,443.8	423.6	89.3	230.0	3,028.9
Other manufacturing ²	..	..	..	..	..	..	..	..	241.7
2002⁷									
Logging	3.6	8.9	21.5	82.2	5.3	6.4	2.8	5	135.6
Oil and gas extraction	32.5	18.2	155.9	9.6	177.1	53.7	15.4	77.1	539.5
Mining	27	11.3	73.7	3.3	91.5	34.8	7.7	28.8	278.1
Electric power generation, transmission and distribution	17.1	20.7	28.6	12	83.7	88.1	10.3	65.3	325.8
Natural gas distribution	1.2	0.8	0.8	0.6	1.9	2	0.1	2.4	9.9
Food	22.9	12.5	19.5	0.6	97.3	33.8	17.1	7.9	211.6
Beverage and tobacco products	1	0.4	2	0	9.3	1.2	4.3	1.3	19.5
Wood products	8.9	4	21	27.4	42.2	10.1	3.8	8.3	125.9
Pulp, paper and paperboard mills	41.6	6.5	12.9	1.8	265.1	69.2	8.2	16.5	421.8
Petroleum and coal products	7.1	3	76.4	0.1	80.1	68	2.6	7.1	244.3
Chemicals	41.2	6.9	20.4	5.2	133	69.8	3	23	302.5
Non-metallic mineral products	5.3	2	20.7	0.1	27.1	6	5.4	10.2	76.9
Primary metals	38.1	11.1	11.2	5.6	366.1	69.2	5.1	16.2	522.5
Fabricated metal products ⁹	4.6	6.8	0.1	2.6	57.2	4.9	0.6	7.5	84.4
Transportation equipment	7.4	4.5	11.9	0.1	134.2	14.8	0.8	28.3	201.9
Pipeline transportation ⁶	3.1	3.9	13	1.6	17.1	10.3	1.5	7.6	58.3
Operating expenditures, excluding "other manufacturing"	262.8	121.7	489.8	152.8	1,558.0	542.3	88.6	312.4	3,558.4
Other manufacturing ²	..	..	..	..	..	..	..	..	273.6

See footnotes at the end of the table.

Table 4.3 – continued

Operating expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe), waste management and sewerage service	Pollution prevention processes	Fees, fines and licences	Other	Total
millions of dollars									
2004⁷									3 836.1
Logging	5.2	13.9	35.1	113.7	19.6	4.2	2.0	6.4	200.0
Oil and gas extraction	39.0	26.9	196.7	6.2	187.0	40.9	25.2	77.9	599.9
Mining	38.8	11.3	80.0	2.3	101.9	38.9	7.4	11.9	292.6
Electric power generation, transmission and distribution	16.0	26.0	30.4	18.6	49.0	19.5	5.8	60.0	225.3
Natural gas distribution	0.4	0.9	0.7	0.3	1.3	16.1	0.7	6.3	26.6
Food	33.6	2.9	4.8	0.2	88.5	20.2	11.7	5.6	167.4
Beverage and tobacco products	0.9	0.5	0.2	0.0 ⁸	9.3	0.6	2.0	0.7	14.2
Wood products	25.9	3.3	9.2	21.1	49.5	26.1	5.0	7.4	147.5
Pulp, paper and paperboard mills	38.3	5.4	4.5	5.5	243.4	87.9	10.8	13.4	409.2
Petroleum and coal products	12.0	2.3	123.5	0.2	56.2	41.8	3.2	7.8	246.9
Chemicals	39.0	6.7	26.4	10.7	162.9	66.2	2.9	18.0	332.8
Non-metallic mineral products	7.8	3.5	9.8	0.7	36.4	6.9	3.9	4.7	73.6
Primary metals	35.4	9.2	14.9	0.6	391.5	100.0	4.9	15.9	572.6
Fabricated metal products ⁹	2.8	2.3	2.4	0.0 ⁸	35.0	3.1	0.3	4.6	50.6
Transportation equipment	6.9	4.1	1.1	0.0 ⁸	97.0	11.6	0.6	17.5	138.9
Pipeline transportation ⁶	2.5	2.1	18.8	3.7	5.6	29.3	1.1	9.9	73.0
Operating expenditures, excluding "other manufacturing"	304.4	121.3	558.6	183.8	1534.1	513.3	87.7	268.3	3 571.5
Other manufacturing ²	..	..	..	..	..	..	..	..	264.7

1. In 1995, the transportation equipment industry is included in "other manufacturing" because of data quality constraints.
2. Detail of the expenditure breakdown by type of environmental protection activity is only available for the listed industries.
3. Before 1997 the wood products industry was included with "other manufacturing".
4. Before the 1998 reference year establishments were selected based on the 1980 Standard Industrial Classification System (SIC). However, beginning with reference year 1998, industry selection was based on the North American Industry Classification System (NAICS). For further information, see Statistics Canada, 2001, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.
5. Operating expenditures on wildlife and habitat protection are included with operating expenditures on reclamation and decommissioning.
6. Before the 1998 reference year, pipeline transportation was included with gas distribution systems.
7. As of reference year 1998, the Survey of Environmental Protection Expenditures is conducted every two years.
8. Operating expenditures on wildlife and habitat protection are included with operating expenditures on other.
9. Before 2000 the fabricated metal products industry was included with "other manufacturing".

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Table 4.4

Capital expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe)	Pollution prevention processes	Total
millions of dollars							
1995							
Logging	0.1	..	0.2	..	3.3	0.6	2,090.3
Crude petroleum and natural gas	3.2	5.9	82.1	1.1	209.1	16.5	79
Mining	11	0.6	21.7	0.1	45.6	5.4	317.9
Electric power systems	9.4	x	10.4	x	47.4	16.1	84.5
Food	2.4	x	0.8	x	13.1	7.8	146
Beverage	1.4	0.1	0.7	0	1.6	3.7	7.5
Pulp and paper	11.3	2.2	6.6	3.8	67.0	128.5	822.3
Refined petroleum and coal products	16.1	0.5	0.3	0	67.1	12.4	96.5
Chemicals	10.5	0.2	16.8	0.9	34.7	20.2	83.3
Non-metallic mineral products	2.3	0.2	0.9	0.4	42.6	6.4	52.8
Primary metals	7.2	0.5	0.3	0.1	55.6	45.8	109.5
Pipeline transport and gas distribution systems	2.8	2.1	4.1	1.7	13.4	5.5	29.7
Capital expenditures, excluding "other manufacturing"	77.7	38.0	144.9	49.3	1,203.5	268.9	1,782.3
Other manufacturing 1, 2	..	..	..	..	..	..	308
1996							
Logging	0.4	0.3	1.4	1.9	10.1	1.3	1,915.8
Crude petroleum and natural gas	6.7	3.8	79.5	3.7	158.4	18.5	270.6
Mining	1.7	1.5	11.1	0.4	49.2	13.6	77.5
Electric power systems	7	22.4	6.4	16.9	37	7.9	97.6
Food and tobacco products	1.7	x	0.1	x	37.4	29.1	68.8
Beverage	2.1	0.2	0.7	0	3.5	1.6	8
Pulp and paper	16.9	2.4	13.7	1.4	297.4	319	650.8
Refined petroleum and coal products	3.1	3.6	4.5	0	42.1	44.4	97.7
Chemicals	24.6	0.4	6.5	0.1	45.1	17.2	93.9
Non-metallic mineral products	2	x	1.3	x	33.6	6.3	43.5
Primary metals	5.3	x	0.7	x	61.8	180.5	250
Transportation equipment	0.8	0.2	3.3	0.7	25.3	31	61.4
Pipeline transport and gas distribution systems	0.8	2.8	7.4	2.3	20.6	11.6	45.6
Capital expenditures, excluding "other manufacturing"	73.3	40.1	136.5	27.6	821.4	681.8	1,780.7
Other manufacturing 2	..	..	..	..	..	..	135
1997							
Logging	0	0.6	0.8	0.8	0.9	4.6	1,748.6
Crude petroleum and natural gas	7.7	8.7	63.4	3.2	59.2	40.7	183
Mining	2.3	5.2	7.7	0.8	31	33.4	80.4
Electric power systems	x	18.9	x	17.5	57.4	9.8	113.9
Food and tobacco products	x	0.1	x	x	39.5	31.5	73.8
Beverage	0.8	0.1	0.8	0	3.4	1.4	6.5
Wood products 3	3.4	1	x	x	49.3	21.6	77.4
Pulp and paper	6.2	1.9	3.5	3	180	136.8	331.5
Refined petroleum and coal products	2.8	3.1	13.4	3.8	38.7	63.2	124.8
Chemicals	7.4	5.3	9.4	0.8	64.5	65	152.5
Non-metallic mineral products	0.3	0.7	1.9	0	19.8	9.4	32.1
Primary metals	18.5	0.4	x	x	107.7	161.9	290.4
Transportation equipment	0.8	0.2	x	x	24.8	93.2	121.2
Pipeline transport and gas distribution systems	0.6	6.2	5	1.3	14.1	43.3	70.6
Capital expenditures, excluding "other manufacturing"	60.9	52.3	113.8	32.3	690.3	716.0	1,665.7
Other manufacturing 2	..	..	..	..	..	..	82.9
1998 4							
Logging	0.5	0.1	0.2	3	1.5	2.1	1,734.2
Oil and gas extraction	4.3	9.9	69.4	0.9	55.5	46.5	186.5
Mining	2.1	5.8	8.1	3.8	33.4	28.1	81.2
Electric power generation, transmission and distribution	4.9	19.2	1.7	20.7	56.5	21	124
Natural gas distribution	0.1	0.6	0.6	0.2	1	14.5	16.8
Food	2.5	0.9	1.3	5.8	37.6	12.7	60.8
Beverage and tobacco products	1	0.2	0.1	0.2	2.6	1.5	5.5
Wood products	3.1	0.6	6.4	2.4	66	17.8	96.3
Pulp, paper and paperboard mills	13.2	0.5	4.6	1.1	89.1	179.2	287.7
Petroleum and coal products	0.5	3	5.4	1.2	82.2	48.6	141
Chemicals	18.6	3.3	7	0.4	65.7	94.3	189.2
Non-metallic mineral products 5	4	0.1	2.5	..	32.6	15.1	54.3
Primary metals	4.6	0.4	1.4	1.3	102.9	73.4	184
Transportation equipment	0.7	0.2	1	0.2	16.3	30.4	48.7
Pipeline transportation 6	0.6	6.4	2.9	0.5	41.6	63.7	115.6
Capital expenditures, excluding "other manufacturing"	60.7	51.0	112.5	41.6	684.6	648.7	1,599.1
Other manufacturing 2	..	..	..	..	..	..	135

See footnotes at the end of the table.

Table 4.4 – continued

Capital expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe)	Pollution prevention processes	Total
millions of dollars							
2000⁷	..	..	..	..	..	..	2,177.9
Logging	0	0.1	0.1	3.4	0.1	1.2	4.8
Oil and gas extraction	11.8	14.1	73.8	5.9	244.8	114.8	465.1
Mining	1.5	0.8	5	2.9	65	67.4	142.6
Electric power generation, transmission and distribution ⁸	7.8	36.5	..	4	56	78.1	182.4
Natural gas distribution	0.2	1	0.3	0.2	0.5	0.6	2.8
Food	3.3	4.8	4.7	0.2	45.5	27.8	86.3
Beverage and tobacco products	0.2	0	0.2	0.5	0.9	2.5	4.4
Wood products ⁸	1.3	6.7	..	1	51.2	63.1	123.3
Pulp, paper and paperboard mills	3.2	0.9	2.7	1.8	85.8	140.4	234.8
Petroleum and coal products	1.6	0.3	3	0.3	119.1	90.3	214.6
Chemicals	4.5	1.1	13.4	0.4	60.6	67.5	147.6
Non-metallic mineral products	2	2.4	3.3	0	85.5	13.2	106.3
Primary metals	1.9	0.5	1.8	0.4	37.1	63.6	105.3
Fabricated metal products ⁹	0.6	0.1	0.5	0.1	5.7	7.9	14.9
Transportation equipment	0.2	0.5	0.8	0	13.7	187.9	203.1
Pipeline transportation ⁶	1.3	1.9	3	0.6	9.9	17.4	33.9
Capital expenditures, excluding "other manufacturing"	41.4	71.7	112.5	21.8	881.4	943.7	2,072.5
Other manufacturing ²	..	..	..	..	..	..	105.4
2002⁷	..	..	..	..	..	..	2,946.6
Logging	0	0	0.1	x	x	0.6	5.8
Oil and gas extraction	111.3	23.7	92.4	5.5	85.9	243.7	562.4
Mining	2.5	3.9	21.8	1.6	36.3	31.1	97.3
Electric power generation, transmission and distribution	9.3	26.9	15.7	13.5	218.3	228.2	511.9
Natural gas distribution	x	x	0.8	x	x	x	18
Food	10.3	2.6	4	2.7	59.5	46.4	125.4
Beverage and tobacco products	0.7	0.1	3.3	0	1.9	6.4	12.3
Wood products	x	0.4	0.2	0.6	x	29	62.7
Pulp, paper and paperboard mills	3.8	0.1	0.8	0.3	57.4	152.9	215.3
Petroleum and coal products	30.7	7.2	39.8	7	226.7	499.9	811.3
Chemicals	x	x	10.7	x	26.4	x	94.5
Non-metallic mineral products	1.5	0.1	1.1	3.2	38.7	24.4	69
Primary metals	8.8	1.1	11.2	0.7	87.4	31.1	140.1
Fabricated metal products ⁹	x	x	0.2	x	x	x	14.9
Transportation equipment	0.5	0.3	0.7	0.5	29.7	27.3	58.9
Pipeline transportation ⁶	x	x	4.7	x	x	32	49.7
Capital expenditures, excluding "other manufacturing"	192.3	75.1	207.4	40.0	907.7	1,427.2	2,849.7
Other manufacturing ²	..	..	..	..	..	..	97
2004⁷	..	..	..	..	..	..	2917.6
Logging	0.2	0.0 ^s	x	x	0.5	0.1	2.3
Oil and gas extraction	19.8	23.6	232.5	12.6	65.5	207.3	561.4
Mining	1.8	6.4	18.6	6.2	85.9	51.8	170.6
Electric power generation, transmission and distribution	6.3	96.3	16.4	11.6	80.1	71.8	282.5
Natural gas distribution	0.1	0.4	x	x	2.2	8.0	14.3
Food	6.0	0.2	x	x	34.7	36.0	81.1
Beverage and tobacco products	0.0 ^s	0.0	0.0 ^s	0.0	6.0	4.5	10.6
Wood products	2.0	0.4	0.2	0.7	30.7	46.4	80.4
Pulp, paper and paperboard mills	2.6	0.3	7.1	0.2	99.7	53.3	163.1
Petroleum and coal products	15.9	4.0	37.5	3.7	93.1	779.5	933.6
Chemicals	4.9	2.5	6.4	0.1	32.5	38.3	84.7

See footnotes at the end of the table.

Table 4.4 – continued

Capital expenditures on environmental protection by type of activity and industry

	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe)	Pollution prevention processes	Total
millions of dollars							
Non-metallic mineral products	3.7	1.3	6.0	12.2	25.7	54.6	103.6
Primary metals	9.2	0.7	9.3	0.0 ^s	103.2	46.7	169.0
Fabricated metal products ⁹	1.0	0.1	0.0 ^s	0.1	12.3	20.3	33.8
Transportation equipment	1.4	0.9	0.0 ^s	0.0 ^s	33.1	52.0	87.5
Pipeline transportation ⁶	0.5	4.4	6.5	0.9	4.7	37.3	54.4
Capital expenditures, excluding "other manufacturing"	75.4	141.5	345.5	52.6	710.0	1507.9	2832.9
Other manufacturing ²	..	..	..	..	..	..	84.8

1. In 1995, the transportation equipment industry is included in "other manufacturing" because of data quality constraints.
2. Detail of the expenditure breakdown by type of environmental protection activity is only available for the listed industries.
3. Before 1997 the wood products industry was included with "other manufacturing".
4. Before the 1998 reference year establishments were selected based on the 1980 Standard Industrial Classification System (SIC). However, beginning with reference year 1998, industry selection was based on the North American Industry Classification System (NAICS). For further information, see Statistics Canada, 2001, Environmental Protection Expenditures in the Business Sector 1998, catalogue no. 16F0006X.
5. Capital expenditures on wildlife and habitat protection are included with capital expenditures on reclamation and decommissioning.
6. Before the 1998 reference year, pipeline transportation was included with gas distribution systems.
7. As of reference year 1998, the Survey of Environmental Protection Expenditures is conducted every two years.
8. Capital expenditures on reclamation and decommissioning are included with capital expenditures on environmental assessments and audits.
9. Before 2000 the fabricated metal products industry was included with "other manufacturing".

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Table 4.5

Distribution of capital expenditures on pollution prevention by medium and industry, 2004

	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	Other	Total
millions of dollars						
Total	826.0	306.9	276.9	45.9	52.2	1507.9
Logging	0	0 ^s	0 ^s	0	0.1	0.1
Oil and gas extraction	131.1	18.9	42.8	3.6	11.0	207.3
Mining	6.2	24.3	21.2	0	0.1	51.8
Electric power generation, transmission and distribution	36.7	19.4	x	x	x	71.8
Natural gas distribution	2.1	0.2	5.7	0	0	8.0
Food	11.6	12.3	6.9	0.1	5.2	36.0
Beverage and tobacco products	2.8	0.9	0.1	0	0.7	4.5
Wood products	26.7	15.4	x	x	x	46.4
Pulp, paper and paperboard mills	27.7	14.3	4.2	1.3	5.7	53.3
Petroleum and coal products	446.3	170.1	123.5	x	x	779.5
Chemicals	14.3	7.3	10.2	0.4	6.0	38.3
Non-metallic mineral products	31.8	3.7	7.0	0.1	12.1	54.6
Primary metals	17.5	3.4	23.4	0.1	2.3	46.7
Fabricated metal products	19.6	0.1	0.1	0	0.5	20.3
Transportation equipment	46.6	1.1	1.8	0.2	2.3	52.0
Pipeline transportation	5.1	15.3	13.4	1.2	2.3	37.3

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Table 4.6

Distribution of capital expenditures on pollution abatement and control (end-of-pipe) by medium and industry, 2004

	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	Total
millions of dollars					
Total	409.4	183.0	96.4	21.2	710.0
Logging	0.1	0.0	0.4	0.0	0.5
Oil and gas extraction	31.9	13.9	17.0	2.7	65.5
Mining	x	53.1	2.9	x	85.9
Electric power generation, transmission and distribution	x	20.8	9.7	x	80.1
Natural gas distribution	0.4	0.0	1.8	0.0	2.2
Food	12.1	11.4	11.0	0.2	34.7
Beverage and tobacco products	0.5	4.8	0.2	0.6	6.0
Wood products	24.7	4.1	1.7	0.1	30.7
Pulp, paper and paperboard mills	58.9	29.5	10.6	0.7	99.7
Petroleum and coal products	41.1	22.5	22.5	7.1	93.1
Chemicals	16.8	10.2	4.6	0.9	32.5
Non-metallic mineral products	24.3	0.4	0.4	0.6	25.7
Primary metals	82.1	9.9	10.5	0.8	103.2
Fabricated metal products	10.6	1.2	0.3	0.1	12.3
Transportation equipment	x	0.5	0.0 ^s	x	33.1
Pipeline transportation	1.1	0.9	2.7	0.0	4.7

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Table 4.7

Pollution prevention methods by industry

	Product design or reformulation	Equipment or process modifications	Recirculation, recovery, reuse or recycling	Materials, feedstock or solvent substitution	Improved management or purchasing techniques	Prevention of leaks and spills	Good operating practices or training	Energy conservation	Other
percent 1									
1995	10	32	64	33	..	50	..	37	5
Logging	0	25	31	6	..	38	..	19	6
Crude petroleum and natural gas	7	39	48	42	..	71	..	77	10
Mining	5	25	50	36	..	59	..	39	7
Electric power systems	18	27	73	82	..	46	..	73	18
Food	4	26	69	13	..	51	..	33	1
Beverage	13	33	75	17	..	33	..	46	4
Pulp and paper	11	46	44	16	..	54	..	25	3
Refined petroleum and coal products	8	0	39	15	..	54	..	46	0
Chemicals	20	37	69	41	..	59	..	30	8
Non-metallic mineral products	19	23	68	34	..	49	..	38	9
Primary metals	9	51	65	42	..	42	..	37	7
Pipeline transport and gas distribution systems	8	23	62	39	..	69	..	77	0
Other manufacturing 2	7	28	69	43	..	42	..	36	3
1996	11	31	66	37	..	49	..	42	8
Logging	4	4	46	17	..	63	..	25	0
Crude petroleum and natural gas	3	41	66	41	..	79	..	76	0
Mining	5	23	58	27	..	49	..	42	21
Electric power systems	12	24	77	59	..	47	..	82	6
Food and tobacco products	12	25	60	29	..	52	..	43	7
Beverage	13	43	83	15	..	38	..	43	5
Pulp and paper	5	41	47	27	..	51	..	37	13
Refined petroleum and coal products	13	13	50	19	..	75	..	44	13
Chemicals	20	36	71	43	..	62	..	30	17
Non-metallic mineral products	9	30	73	39	..	42	..	39	9
Primary metals	5	37	70	39	..	49	..	38	6
Transportation equipment	18	43	80	57	..	51	..	57	6
Pipeline transport and gas distribution systems	4	7	68	43	..	75	..	71	4
Other manufacturing 2	13	29	72	40	..	39	..	38	4
1997	15	24	64	37	..	51	..	42	10
Logging	9	3	34	14	..	80	..	6	6
Crude petroleum and natural gas	34	40	74	49	..	94	..	66	6
Mining	4	23	59	24	..	50	..	54	3
Electric power systems	7	20	53	53	..	93	..	73	13
Food and tobacco products	14	30	67	30	..	63	..	59	6
Beverage	25	18	57	21	..	50	..	32	14
Wood products 3	16	21	58	35	..	61	..	35	9
Pulp and paper	8	27	72	31	..	58	..	41	12
Refined petroleum and coal products	39	44	72	50	..	78	..	61	0
Chemicals	27	23	61	36	..	69	..	39	5
Non-metallic mineral products	12	25	75	31	..	39	..	33	8
Primary metals	11	43	70	37	..	51	..	54	2
Transportation equipment	19	32	64	56	..	57	..	56	5
Pipeline transport and gas distribution systems	17	11	50	44	..	78	..	72	11
Other manufacturing 2	12	18	63	41	..	30	..	33	18
1998 4	17	23	66	31	..	59	..	45	10
Logging	0	15	33	3	..	82	..	12	3
Oil and gas extraction	27	35	71	40	..	88	..	75	6
Mining	6	18	67	21	..	53	..	42	8
Electric power generation, transmission and distribution	13	22	65	52	..	87	..	74	4
Natural gas distribution	0	25	38	25	..	75	..	63	0
Food	13	26	72	34	..	55	..	61	3
Beverage and tobacco products	8	16	50	24	..	63	..	50	11
Wood products 3	23	25	62	22	..	58	..	40	12
Pulp, paper and paperboard mills	10	24	76	38	..	73	..	54	7
Petroleum and coal products	26	32	74	26	..	79	..	63	0
Chemicals	30	24	72	27	..	71	..	33	4
Non-metallic mineral products	18	20	67	27	..	49	..	51	9
Primary metals	14	28	82	31	..	55	..	54	6
Transportation equipment	21	25	69	51	..	69	..	56	9
Pipeline transportation 5	25	25	58	33	..	92	..	75	0
Other manufacturing 2	15	20	56	31	..	39	..	35	20

See footnotes at the end of the table.

Pollution prevention methods by industry

	Product design or reformulation	Equipment or process modifications	Recirculation, recovery, reuse or recycling	Materials, feedstock or solvent substitution	Improved management or purchasing techniques	Prevention of leaks and spills	Good operating practices or training	Energy conservation	Other
percent ¹									
2000 ⁶	24	48	67	34	42	73	79	..	14
Logging	0	24	46	20	35	79	78	..	28
Oil and gas extraction	18	86	76	36	58	96	91	..	26
Mining	10	40	84	33	51	92	92	..	18
Electric power generation, transmission and distribution	21	40	62	39	55	79	84	..	19
Natural gas distribution	25	78	56	0	56	100	82	..	0
Food	22	46	61	26	36	65	72	..	12
Beverage and tobacco products	6	41	52	11	33	76	80	..	10
Wood products ³	24	47	70	27	42	67	75	..	17
Pulp, paper and paperboard mills	17	68	83	36	34	87	89	..	16
Petroleum and coal products	48	54	76	34	44	91	94	..	6
Chemicals	40	54	77	40	45	82	88	..	15
Non-metallic mineral products	22	48	73	31	40	66	76	..	22
Primary metals	16	57	76	34	33	78	80	..	10
Fabricated metal products ⁷	13	39	60	29	34	68	77	..	15
Transportation equipment	33	59	69	53	58	82	88	..	22
Pipeline transportation ⁵	40	49	49	35	55	98	95	..	11
Other manufacturing ²	26	40	56	37	41	55	67	..	11
2002 ⁶	22	49	65	31	37	70	74	..	16
Logging	5	25	61	9	34	84	85	..	19
Oil and gas extraction	30	77	71	42	48	92	91	..	16
Mining	9	35	77	32	39	82	79	..	34
Electric power generation, transmission and distribution	14	38	63	36	34	80	78	..	16
Natural gas distribution	11	44	82	22	82	100	100	..	33
Food	16	16	55	21	25	66	69	..	17
Beverage and tobacco products	8	31	40	15	17	46	50	..	9
Wood products ³	16	40	63	19	37	63	74	..	22
Pulp, paper and paperboard mills	10	70	81	30	30	85	90	..	21
Petroleum and coal products	39	63	72	47	43	85	84	..	0
Chemicals	16	40	63	25	35	78	79	..	13
Non-metallic mineral products	23	49	64	29	30	54	62	..	16
Primary metals	12	51	73	32	25	70	70	..	16
Fabricated metal products ⁷	14	49	64	33	41	66	73	..	10
Transportation equipment	32	52	61	48	51	71	69	..	24
Pipeline transportation ⁵	42	70	54	35	58	100	98	..	0
Other manufacturing ²	29	48	62	38	43	59	66	..	11
2004 ⁶	20	47	62	28	36	67	69	..	19
Logging	5	28	54	10	30	74	81	..	12
Oil and gas extraction	23	71	71	25	39	88	86	..	32
Mining	13	43	70	26	43	84	75	..	25
Electric power generation, transmission and distribution	16	37	59	38	48	73	70	..	25
Natural gas distribution	13	53	40	20	27	67	67	..	11
Food	14	45	51	18	31	58	68	..	12
Beverage and tobacco products	5	42	52	5	47	79	70	..	36
Wood products ³	15	41	60	18	30	52	64	..	13
Pulp, paper and paperboard mills	11	56	71	26	26	74	76	..	28
Petroleum and coal products	48	69	79	36	52	93	89	..	0
Chemicals	30	55	66	27	38	78	78	..	10
Non-metallic mineral products	16	32	61	22	15	57	59	..	8
Primary metals	10	47	68	25	35	72	67	..	23
Fabricated metal products ⁷	17	45	60	28	43	54	63	..	10
Transportation equipment	22	57	71	49	38	72	77	..	27
Pipeline transportation ⁵	25	56	44	21	35	75	86	..	23
Other manufacturing ²	26	45	59	37	38	56	59	..	25

1. Number of establishments indicating they used the pollution prevention method as a percentage of all establishments that provided a response.

2. Includes all other manufacturing industries not already specified.

3. Before 1997 the wood products industry was included with "other manufacturing".

4. Before the 1998 reference year, establishments were selected based on the 1980 Standard Industrial Classification System (SIC). However, beginning with reference year 1998, industry selection was based on the North American Industry Classification System (NAICS). For further information, see Statistics Canada, 2001, Environmental Protection Expenditures in the Business Sector 1998, catalogue no. 16F0006X.

5. Before the 1998 reference year, pipeline transportation was included with gas distribution systems.

6. As of reference year 1998, the Survey of Environmental Protection Expenditures is conducted every two years.

7. Before 2000 the fabricated metal products industry was included with "other manufacturing".

Note(s): This table includes reported data only. The question on pollution prevention methods differed in reference years 1995 and 1996. Therefore, comparisons from 1995 to 1998 provide a general view but should be treated with caution.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Table 4.8
Environmental management practices by industry

	Environmental management system	Life cycle analysis	ISO 14000 certification	Implementation of a pollution prevention plan	Environmental voluntary agreements	'Green' procurement policy	Eco-labelling of products	Annual environmental performance report	Other	Total ²
percent ¹										
1998	64	19	10	..	37	14	6	34	20	82
Logging	59	10	17	..	16	3	5	50	10	72
Oil and gas extraction	88	47	3	..	77	24	6	40	20	93
Mining	72	22	5	..	51	18	..	55	39	91
Electric power generation, transmission and distribution	74	27	27	..	68	8	12	52	50	93
Natural gas distribution	92	25	8	..	91	42	..	67	..	100
Food	50	9	4	..	12	12	2	13	8	63
Beverage and tobacco products	55	14	3	..	25	23	19	14	7	78
Wood products	50	9	5	..	14	9	6	28	12	69
Pulp, paper and paperboard mills	70	11	17	..	65	11	16	63	21	95
Petroleum and coal products	74	52	7	..	58	11	11	49	50	88
Chemicals	69	28	17	..	46	17	9	34	28	89
Non-metallic mineral products	61	17	5	..	11	14	3	31	14	75
Primary metals	58	13	6	..	28	11	..	18	13	82
Transportation equipment	62	19	23	..	26	19	2	23	17	81
Pipeline transportation	91	43	5	..	86	14	..	52	33	100
2000	52	11	11	..	29	13	5	38	10	72
Logging	76	2	50	..	26	9	17	61	12	86
Oil and gas extraction	82	23	10	..	82	27	5	62	13	92
Mining	66	16	3	..	49	16	2	67	20	84
Electric power generation, transmission and distribution	53	14	17	..	47	18	8	44	14	73
Natural gas distribution	91	30	0	..	82	46	10	80	x	100
Food	48	10	4	..	10	14	3	25	10	64
Beverage and tobacco products	41	1	3	..	23	7	1	36	10	67
Wood products	42	5	11	..	23	13	11	38	7	63
Pulp, paper and paperboard mills	65	12	25	..	57	11	11	71	15	89
Petroleum and coal products	71	36	15	..	46	13	24	61	15	80
Chemicals	60	15	5	..	36	14	7	46	14	78
Non-metallic mineral products	60	8	2	..	18	17	4	36	9	78
Primary metals	55	9	11	..	34	10	1	38	8	74
Fabricated metal products	41	8	7	..	13	8	6	15	5	57
Transportation equipment	65	16	30	..	20	19	0	33	11	76
Pipeline transportation	81	14	0	..	93	14	0	86	0	100
Sub-total excluding 'other manufacturing'	58	12	11	..	34	14	6	45	11	75
Other manufacturing ³	32	7	10	..	10	12	3	17	8	60
2002	56	14	19	..	29	14	5	41	9	71
Logging	82	11	66	..	23	20	24	48	4	88
Oil and gas extraction	90	34	5	..	81	23	4	81	16	97
Mining	75	19	9	..	53	19	0	72	23	88
Electric power generation, transmission and distribution	64	27	22	..	50	20	15	54	0	72
Natural gas distribution	92	36	18	..	92	27	0	92	25	100
Food	38	7	3	..	11	11	1	24	4	53
Beverage and tobacco products	36	5	3	..	20	5	0	29	9	55
Wood products	48	7	18	..	23	18	15	40	9	61
Pulp, paper and paperboard mills	75	10	38	..	43	8	6	76	18	93
Petroleum and coal products	73	38	19	..	50	9	22	67	0	88
Chemicals	61	19	11	..	37	12	3	45	11	76
Non-metallic mineral products	40	15	13	..	21	14	4	24	8	62
Primary metals	54	9	20	..	29	9	0	39	7	67
Fabricated metal products	54	6	23	..	13	13	0	23	0	68
Transportation equipment	66	22	46	..	23	18	4	34	12	75
Pipeline transportation	100	29	2	..	98	33	0	76	0	100
Sub-total excluding 'other manufacturing'	61	15	23	..	35	14	5	47	9	74
Other manufacturing ³	38	10	19	..	10	12	3	23	7	63

See footnotes at the end of the table.

Table 4.8 – continued

Environmental management practices by industry

	Environmental management system	Life cycle analysis	ISO 14000 certification	Implementation of a pollution prevention plan	Environmental voluntary agreements	'Green' procurement policy	Eco-labelling of products	Annual environmental performance report	Other	Total ²
percent ¹										
2004	58	14	25	42	23	12	5	41	7	73
Logging	82	13	74	56	29	15	21	54	7	88
Oil and gas extraction	83	33	11	45	58	9	3	68	17	92
Mining	78	11	19	52	31	13	3	71	13	92
Electric power generation, transmission and distribution	61	31	26	47	43	25	15	55	11	72
Natural gas distribution	80	33	13	64	67	27	13	53	0	87
Food	43	9	1	28	10	10	1	27	9	69
Beverage and tobacco products	62	5	19	33	10	5	0	19	0	71
Wood products	46	6	22	33	15	13	12	35	6	59
Pulp, paper and paperboard mills	75	7	55	63	34	13	13	70	10	92
Petroleum and coal products	83	41	31	72	38	3	7	59	11	83
Chemicals	67	21	18	55	26	10	5	45	6	81
Non-metallic mineral products	45	5	9	33	16	15	6	37	4	66
Primary metals	56	9	30	35	25	5	1	35	10	69
Fabricated metal products	39	7	24	28	11	7	1	15	7	52
Transportation equipment	76	24	61	56	19	19	4	41	10	81
Pipeline transportation	93	19	10	51	69	19	0	76	2	97
Sub-total excluding 'other manufacturing'	63	14	26	45	27	12	6	46	8	76
Other manufacturing ³	40	11	23	31	9	13	2	24	5	63

1. Number of establishments indicating they used the practice as a percentage of all establishments that provided a response.

2. Number of establishments indicating they used at least one environmental practice as a percentage of the total number of establishments that provided a response.

3. Includes all other manufacturing industries not already specified. Information on environmental management practices used by the "other manufacturing" category was not collected in 1998.

Note(s): This table includes reported data only.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environmental Protection Expenditures in the Business Sector, catalogue no. 16F0006X.

Waste diversion, by province and territory, 2002^r and 2004

	Waste disposed per capita ¹		Diverted materials per capita ²		Diversion rate	
	2002 ^r	2004	2002 ^r	2004	2002 ^r	2004
kilograms per capita						
Newfoundland and Labrador	725	773	58	68	7.5	8.1
Prince Edward Island	x	x	x	x	28.2	34.8
Nova Scotia	416	427	205	235	33.0	35.5
New Brunswick	551	588	174	191	24.0	24.5
Quebec ³	785	816	234	282	23.0	25.7
Ontario	797	809	187	234	19.0	22.5
Manitoba	776	793	187	200	19.4	20.2
Saskatchewan	798	838	117	134	12.8	13.7
Alberta	927	968	222	236	19.3	19.6
British Columbia	653	676	296	298	31.2	30.6
Yukon Territory, Northwest Territories and Nunavut	x	x	x	x	10.4	11.6
Canada	769	791	212	246	21.6	23.7

1. Total amount of non-hazardous waste disposed of in public and private waste disposal facilities. This includes waste that is exported out of the source province or out of the country for disposal. This does not include wastes disposed in hazardous waste disposal facilities or wastes managed by the waste generator on site.

2. This information covers only those companies and local waste management organizations that reported non-hazardous recyclable material preparation activities and refers only to that material entering the waste stream and does not cover any waste that may be managed on-site by a company or household. Additionally, these data do not include those materials transported by the generator directly to secondary processors such as pulp and paper mills while bypassing entirely any firm or local government involved in waste management activities.

3. Waste diversion and residential sector disposal data are derived from a survey administered by RECYC-QUÉBEC.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Waste Management Industry Survey: Business and Government Sectors, catalogue no. 16F0023X.

Table 4.10

Disposal of waste, by source and by province and territory, 2002^r and 2004^t

	Residential sources ²		Non-residential sources ³		Total waste disposed	
	2002 ^r	2004	2002 ^r	2004	2002 ^r	2004
tonnes						
Newfoundland and Labrador	216,218	228,004	160,376	172,044	376,594	400,048
Prince Edward Island	x	x	x	x	x	x
Nova Scotia	169,649	179,262	219,546	220,705	389,194	399,967
New Brunswick	203,506	208,120	210,100	234,053	413,606	442,173
Quebec ⁴	2,876,000	2,904,000	2,970,459	3,255,960	5,846,459	6,159,960
Ontario	3,438,408	3,522,369	6,207,225	6,530,785	9,645,633	10,053,154
Manitoba	412,612	450,658	483,944	477,460	896,556	928,118
Saskatchewan	278,692	298,612	516,432	534,899	795,124	833,511
Alberta	866,398	943,420	2,023,896	2,133,890	2,890,294	3,077,311
British Columbia	929,101	1,001,147	1,758,781	1,840,214	2,687,882	2,841,361
Yukon Territory, Northwest Territories and Nunavut	x	x	x	x	x	x
Canada	9,447,531	9,792,787	14,633,841	15,498,228	24,081,371	25,291,015

1. Total amount of non-hazardous waste disposed of in public and private waste disposal facilities. This includes waste that is exported out of the source province or out of the country for disposal. This does not include wastes disposed in hazardous waste disposal facilities or wastes managed by the waste generator on site.
2. Residential non-hazardous wastes disposed includes solid waste produced by all residences and includes waste that is picked up by the municipality (either using its own staff or through contracting firms), and waste from residential sources that is self-hauled to depots, transfer stations and disposal facilities.
3. Non-residential non-hazardous solid wastes are those wastes generated by all sources excluding the residential waste stream. These include: industrial materials, which are generated by manufacturing, and primary and secondary industries, and is managed off-site from the manufacturing operation ; commercial materials, which are generated by commercial operations such as shopping centres, restaurants, offices, etc. ; and institutional materials which are generated by institutional facilities such as schools, hospitals, government facilities, seniors homes, universities, etc. These wastes also include construction, renovation and demolition non-hazardous waste, also referred to as DLC (demolition, land clearing and construction waste). These refer to wastes generated by construction, renovation and demolition activities. It generally includes materials such as wood, drywall, certain metals, cardboard, doors, windows, wiring, etc. It excludes materials from land clearing on areas not previously developed as well as materials that include asphalt, concrete, bricks and clean sand or gravel.
4. Residential sector disposal data are derived from a survey administered by RECYC-QUÉBEC.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Waste Management Industry Survey: Business and Government Sectors, catalogue no. 16F0023X.

Table 4.11

Materials prepared for recycling by type and by province and territory, 2004¹

	Canada	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec ²	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory, Northwest Territories and Nunavut
tonnes												
Total	7,864,647	35,308	x	220,316	143,804	2,130,100	2,905,953	234,549	132,763	755,908	1,251,667	x
Newsprint	1,349,683	x	x	29,072	8,287	516,000	500,952	27,871	23,839	99,083	135,414	x
Cardboard and boxboard	1,367,011	x	x	12,510	13,758	402,000	540,791	51,214	26,265	99,515	193,045	x
Mixed paper	570,154	x	x	3,187	6,929	113,000	187,551	25,261	10,240	33,935	189,345	x
Glass	399,290	x	x	2,181	x	94,000	198,861	7,813	x	49,739	35,991	x
Ferrous metals	675,818	x	x	3,267	1,540	119,100	260,315	85,433	x	95,916	85,471	x
Copper and aluminum	49,289	x	x	x	x	11,000	22,140	x	x	x	5,870	x
Mixed metals	195,639	x	x	6,105	2,422	0	69,780	4,535	1,961	11,447	93,530	x
White Goods	236,786	x	x	4,584	x	183,000	26,178	x	x	12,108	x	0
Electronics	10,245	0	0	x	x	3,000	5,259	x	x	x	x	0
Plastics	188,307	x	x	4,234	1,111	72,000	54,306	4,255	3,082	10,372	38,623	x
Tires	139,331	0	x	x	x	62,000	6,441	3,569	16,467	8,602	38,508	x
Construction, renovation and demolition	848,197	x	x	59,355	14,984	288,000	303,277	x	13,234	27,926	140,514	x
Organics	1,669,145	0	x	93,458	90,585	225,000	644,586	20,995	x	290,959	265,514	x
Other materials	165,755	x	0	1,792	1,963	42,000	85,514	x	x	x	24,088	x

1. This information covers only those companies and local waste management organizations that reported non-hazardous recyclable material preparation activities and refers only to that material entering the waste stream and do not cover any waste that may be managed on-site by a company or household. Additionally, these data do not include those materials transported by the generator directly to secondary processors such as pulp and paper mills while bypassing entirely any firm or local government involved in waste management activities.

2. Waste diversion data are derived from a survey administered by RECYC-QUÉBEC.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Waste Management Industry Survey: Business and Government Sectors, catalogue no. 16F0023X.

Table 4.12

Total and environmental revenues by industry¹, 2004

	Establishments ² number	Environmental goods	Environmental services	Total environmental revenues
				million dollars
Canada	8,503	10,070.1	8,383.3	18,453.4
Agriculture, forestry, fishing and hunting	16	7.1	11.6	18.7
Mining and oil and gas extraction	34	4.0	349.5	353.5
Utilities	18	x	x	153.6
Construction	..	2,080.7 ³	154.7	2,235.5
Chemical manufacturing	57	321.6	35.6	357.2
Plastic and rubber products manufacturing	51	539.9	6.4	546.3
Non-metallic mineral product manufacturing	14	100.1	0.0	100.1
Primary metal manufacturing	8	x	x	51.9
Fabricated metal product manufacturing	57	226.3	6.1	232.4
Machinery manufacturing	143	804.7	26.3	831.0
Computer and electronic product manufacturing	56	196.1	7.9	204.1
Electrical equipment, appliance and component manufacturing	14	x	x	296.2
Rest of manufacturing sector	42	205.2	59.5	264.7
Wholesale trade ⁴	2,884	4,705.0	627.0	5,331.9
Retail trade	22	45.1	1.9	47.0
Finance and insurance services	21	x	x	79.3
Legal services	51	0.0	174.1	174.1
Architectural and landscape architectural services	15	0.0	3.0	3.0
Engineering services	630	133.0	1,163.3	1,296.3
Surveying and mapping (including geophysical) services	20	x	x	28.2
Testing laboratories	109	40.1	211.6	251.7
Computer systems design and related services	26	12.3	8.3	20.6
Environmental consulting services	1,844	22.0	784.4	806.4
Management consulting and other scientific and technical consulting services	151	x	x	182.6
Scientific research and development services	44	36.9	36.4	73.4
All other professional, scientific and technical services	23	x	x	23.1
Management of companies and enterprises	24	26.6	29.2	55.8
Administrative and support services	44	26.2	92.7	118.9
Waste management and remediation services	1,902	20.1	4,191.7	4,211.9
Other services	54	31.1	73.4	104.5

- Environmental establishments that earned revenues from the sale of environmental goods (including construction) or services. Industry groups are based on the North American Industry Classification System (NAICS).
- Excludes establishments involved in environmental engineering construction.
- For reference year 2004, a change was made to the methodology for producing estimates of revenues related to environmental engineering construction. For 2004, estimates of revenues for environmental engineering construction are derived from environmental capital expenditures reported by businesses and governments, supplemented with revenues reported to the Environment Industry Survey for renewable energy production facilities only. Previously, estimates of revenues for environmental engineering construction were derived from environmental capital expenditures reported by businesses and governments, supplemented with revenues reported to the Environment Industry Survey for all types of environmental engineering construction, not only renewable energy production facilities.

4. Includes Recyclable Material Wholesaler-Distributors.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environment Industry: Business Sector, catalogue no. 16F0008X.

Table 4.13

Revenues from sales of environmental goods and services, by province or territory, 2004

	Environmental establishments ¹	Sales of environmental goods (including construction) ²	Sales of environmental services	Total revenues
	number	millions of dollars		
Canada	8,503	10,070.1	8,383.3	18,453.4
Newfoundland and Labrador	148	62.3	84.8	147.1
Prince Edward Island	50	14.4	19.5	33.8
Nova Scotia	384	174.0	215.3	389.3
New Brunswick	271	197.5	138.1	335.6
Quebec	1,662	2,112.2	1,365.8	3,478.0
Ontario	2,638	4,779.7	3,236.9	8,016.6
Manitoba	268	303.0	189.0	492.0
Saskatchewan	325	215.9	185.1	401.0
Alberta	1,330	1,216.4	1,597.6	2,814.0
British Columbia	1,352	985.4	1,314.8	2,300.2
Yukon Territory, Northwest Territories and Nunavut	75	9.3	36.5	45.8

1. Excludes establishments involved in environmental engineering construction.

2. For reference year 2004, a change was made to the methodology for producing estimates of revenues related to environmental engineering construction. For 2004, estimates of revenues for environmental engineering construction are derived from environmental capital expenditures reported by businesses and governments, supplemented with revenues reported to the Environment Industry Survey for renewable energy production facilities only. Previously, estimates of revenues for environmental engineering construction were derived from environmental capital expenditures reported by businesses and governments, supplemented with revenues reported to the Environment Industry Survey for all types of environmental engineering construction, not only renewable energy production facilities.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, Environment Industry: Business Sector, catalogue no. 16F0008X.

Table 4.14

Research and development expenditures and source of funds in the higher education sector, 2005/2006

	Total expenditures	Share of total	Source of funds					
			Federal government	Provincial governments	Business enterprise	Higher education	Private non-profit organizations	Foreign
	millions of dollars		percent					
Total	9,517.3	100.0	26.7	10.2	8.2	45.8	7.8	1.2
Social sciences and humanities ¹	1,896.1	19.9	22.0	10.3	1.5	58.8	7.4	0.0
Health sciences ²	3,758.2	39.5	26.4	7.8	8.9	43.4	12.4	1.2
Other natural sciences and engineering ³	3,863.0	40.6	29.4	12.6	10.8	41.8	3.6	1.8

1. Social sciences embrace all disciplines involving the study of human actions and conditions and the social, economic and institutional mechanisms affecting humans. Included are such disciplines as anthropology, business administration and commerce, communications, criminology, demography, economics, geography, history, languages, literature and linguistics, law, library science, philosophy, political sciences, psychology, religious studies, social work, sociology, and urban and regional studies.

2. Health sciences consist of programmes directed towards the protection and improvement of human health.

3. Other natural sciences consist of disciplines, other than health sciences, concerned with understanding, developing or utilizing the natural world. Included are the engineering, mathematical and physical sciences.

Source(s): Statistics Canada, Science, Innovation and Electronic Information Division, Science Statistics, catalogue no. 88-001-X.

Table 4.15

Federal government research and development expenditures by socio-economic objective

	Intramural 1								
	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
millions of dollars									
Total	1,588	1,627	1,734	1,957	2,000	2,075	1,976	1,983	2,312
Exploration and exploitation of the earth	178	179	186	207	125	141	85	98	110
Infrastructure and general planning of land use									
Transport	34	38	42	37	71	65	56	53	69
Telecommunications	33	32	24	28	44	37	35	43	52
Other	54	50	42	48	30	39	38	38	49
Control and care of the environment	97	98	122	143	142	174	178	181	216
Protection and improvement of human health	80	87	103	116	152	186	196	203	210
Production, distribution and rational utilization of energy	209	170	171	187	248	214	245	199	229
Agricultural production and technology									
Agriculture	317	308	334	333	345	287	275	269	336
Fishing	30	42	43	51	47	55	42	44	47
Forestry	73	74	77	83	75	74	72	71	75
Industrial production and technology	119	123	137	165	164	189	189	174	198
Social structures and relationships	110	125	50	53	47	61	60	62	59
Exploration and exploitation of space	59	92	68	187	175	179	121	125	162
Non-oriented research	51	54	150	150	181	202	206	208	219
Other civil research	15	13	14	16	15	14	14	15	23
Defence	127	136	167	150	134	152	157	191	245
Other	3	4	4	3	5	6	6	10	13
Extramural 2									
	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
millions of dollars									
Total	1,659	1,835	2,030	2,070	2,887	2,737	3,379	3,371	3,649
Exploration and exploitation of the earth	25	29	99	46	69	59	75	55	78
Infrastructure and general planning of land use									
Transport	32	28	23	20	24	25	19	27	48
Telecommunications	21	35	34	15	23	24	27	30	31
Other	13	15	16	20	25	28	31	28	29
Control and care of the environment	73	83	88	112	148	141	171	155	185
Protection and improvement of human health	282	318	390	519	709	866	960	988	1,106
Production, distribution and rational utilization of energy	57	65	68	64	117	75	210	181	103
Agricultural production and technology									
Agriculture	37	44	67	70	75	90	86	79	102
Fishing	8	10	13	14	15	16	23	26	25
Forestry	24	24	43	27	27	41	56	49	44
Industrial production and technology	429	406	398	518	741	657	778	732	884
Social structures and relationships	31	90	87	106	130	149	170	189	203
Exploration and exploitation of space	190	270	269	154	193	179	197	190	164
Non-oriented research	237	229	256	188	365	213	376	428	496
Other civil research	1	2	1	17	17	2	1	2	4
Defence	124	120	121	119	142	100	116	94	93
Other	74	68	57	62	67	72	82	119	54

1. The research and development intramural expenditures are managed and carried out primarily by federal government employees. Non-program (indirect costs) are excluded.

2. The management and conduct of the research and development extramural expenditures are entrusted to a non-federal organization.

Source(s): Statistics Canada, Science, Innovation and Electronic Information Division, Science Statistics, December 2007 edition, catalogue no. 88-001-X.

Abbreviations and equivalences

Abbreviations

°C	degree Celsius
CAC	criteria air contaminant
CAFC	company average fuel consumption
CH ₄	methane
cm	centimetre
CMA	Census metropolitan area
CO	carbon monoxide
CO ₂	carbon dioxide
g	gram
GDP	gross domestic product
GHG	greenhouse gas
GJ	gigajoule
GW	gigawatt
GWh	gigawatt hour
h	hour
ha	hectare
H ₂ O	water
kg	kilogram
km	kilometre
km ²	square kilometre
km ³	cubic kilometre
kt	kilotonne
kW	kilowatt
L	litre
m ²	square metre
m ³	cubic metre
MJ	megajoule
mm	millimetre
Mt	megatonne
MW	megawatt
MWh	megawatt hour
N ₂	nitrogen
N ₂ O	nitrous oxide
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NH ₃	ammonia
NH ₄ ⁺	ammonium ion
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
O ₂	oxygen

PCB	Polychlorinated biphenyl
PJ	petajoule
PM	particulate matter
PM _{2.5}	particulate matter less than or equal to 2.5 microns
PM ₁₀	particulate matter less than or equal to 10 microns
s	second
SO ₂	sulphur dioxide
SO _x	sulphur oxides
SUV	sport utility vehicle
t	tonne
TEQ	toxic equivalency
TJ	terajoule
t-km	tonne kilometre
TPM	total particulate matter
VOC	volatile organic compound

Equivalences

1 hectare =	1 km ² / 100
1 km ² =	100 hectares
1 tonne =	1,000 kilograms

Prefixes of the Metric System

Prefix and (abbreviation)

exa (E)
 peta (P)
 tera (T)
 giga (G)
 mega (M)
 kilo (k)
 hecto (h)
 deca (da)
 deci (d)
 centi (c)
 milli (m)
 micro (μ)
 nano (n)
 pico (p)
 femto (f)
 atto (a)

Multiplication factor

10¹⁸
 10¹⁵
 10¹²
 10⁹
 10⁶
 10³
 10²
 10¹
 10⁻¹
 10⁻²
 10⁻³
 10⁻⁶
 10⁻⁹
 10⁻¹²
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 10⁻¹⁸



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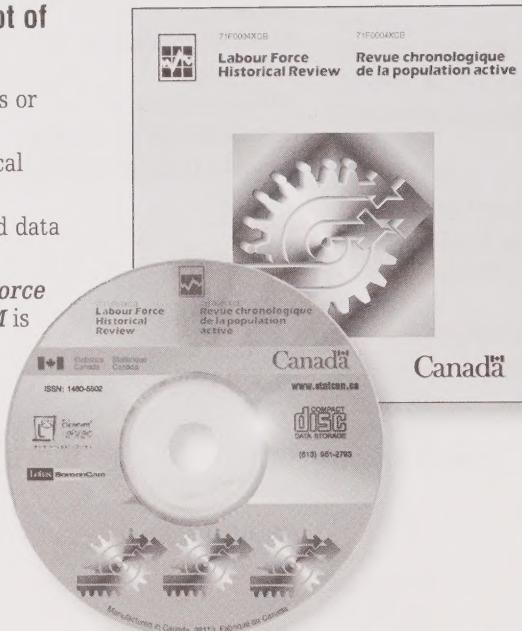
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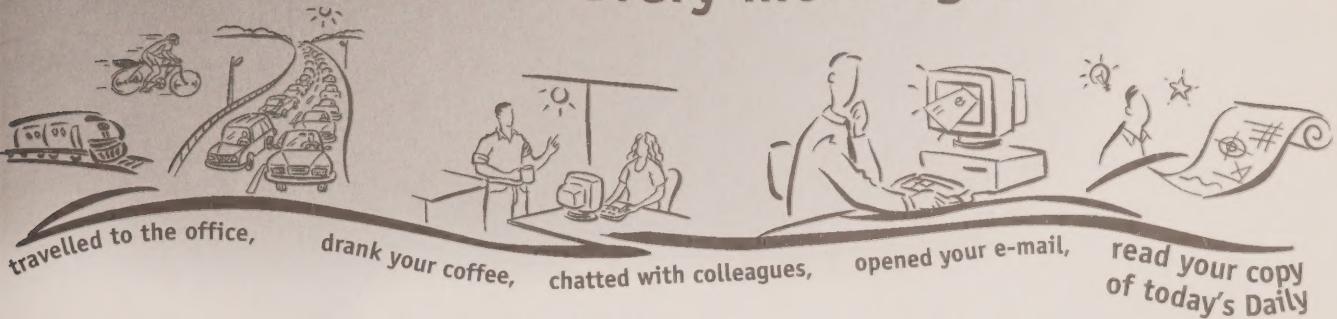
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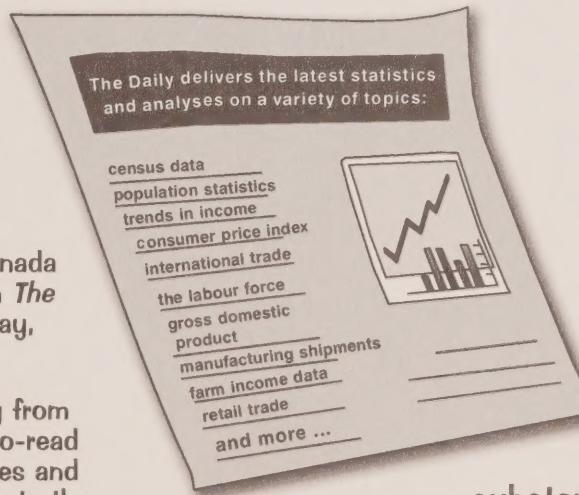


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